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February 1960

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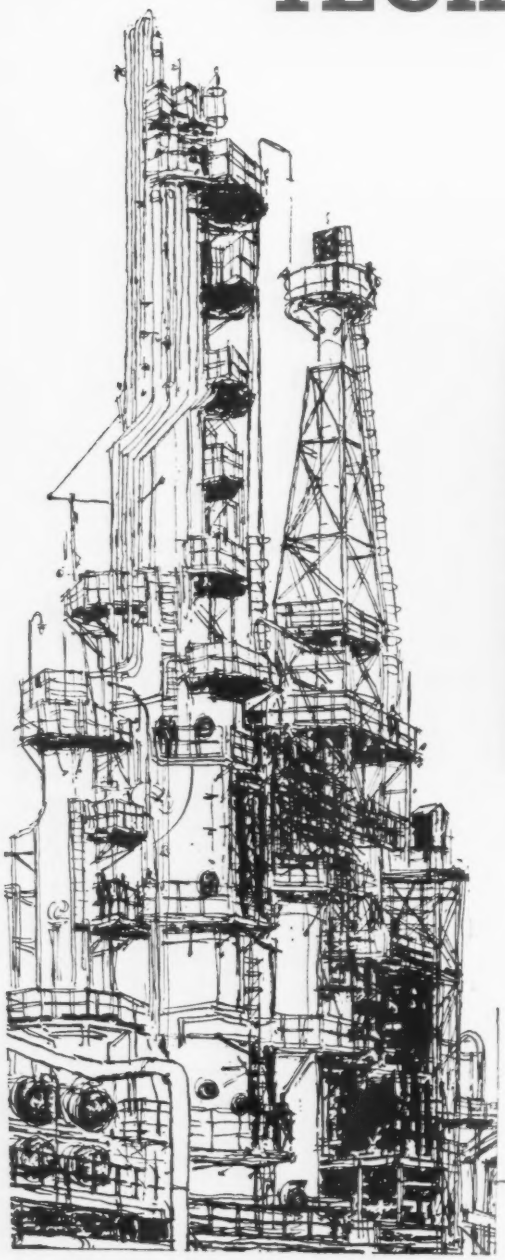

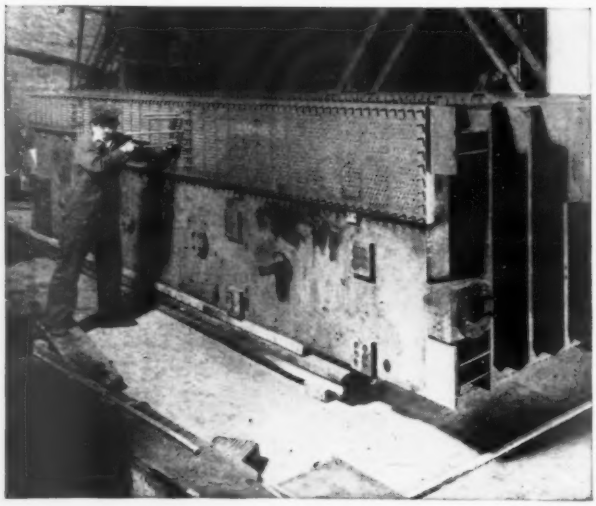

A 50,000 gal. day evaporator for a refinery under construction by Procon (Great Britain) for Anglo Ecuadorian Oilfields, Ltd., being tubed with SERCKALBRA.
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REVIEW

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Contents

IRAN'S NEW CRUDE OIL TERMINAL 33
AROUND THE BRANCHES 40
PERSONAL NOTES 42
NOTES OF THE MONTH 44
STANDARDIZATION COMMITTEE. *By* F. L. Garton ... 48
OIL INDUSTRY CORROSION PROBLEMS 52
U.K. CONSUMPTION OF PETROLEUM PRODUCTS ... 53
NEW YEAR HONOURS 53
STAMPS AND THE OIL INDUSTRY *By* A. G. K. Leonard 54
THE WORLD'S ULTIMATE PETROLEUM RESERVES ... 57
WORLD PETROLEUM STATISTICS 1958 58
BOOKS AND FILMS 64
TRADE LITERATURE 66
FORTHCOMING MEETINGS 68

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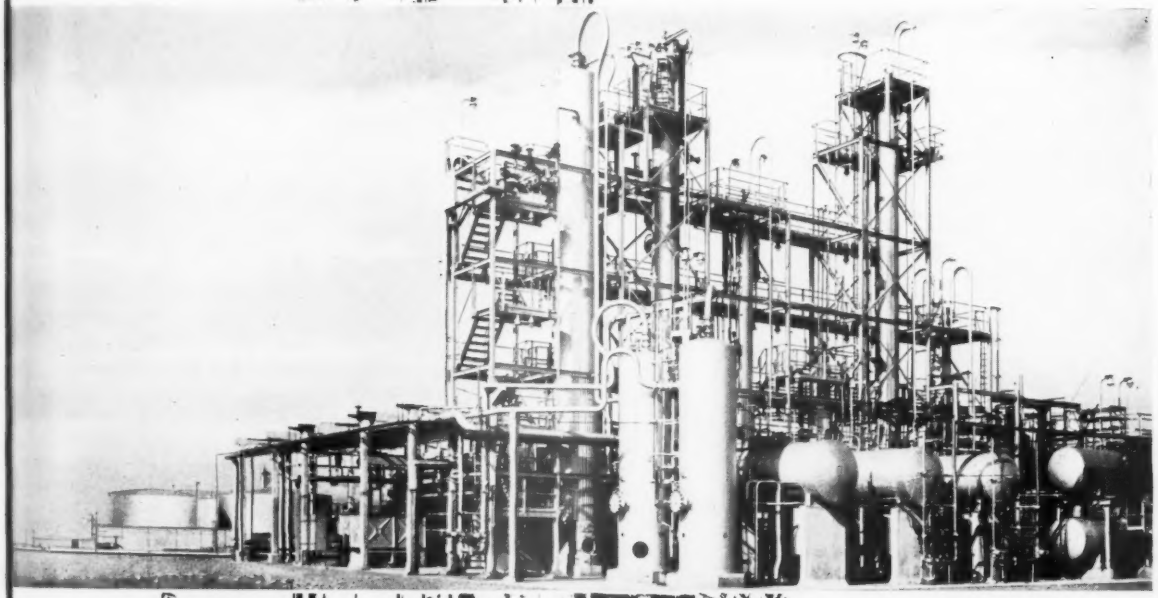

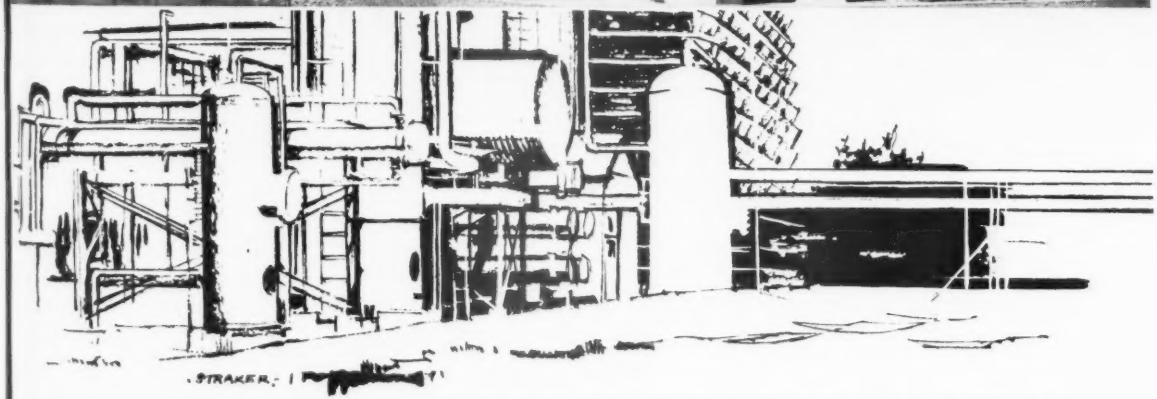

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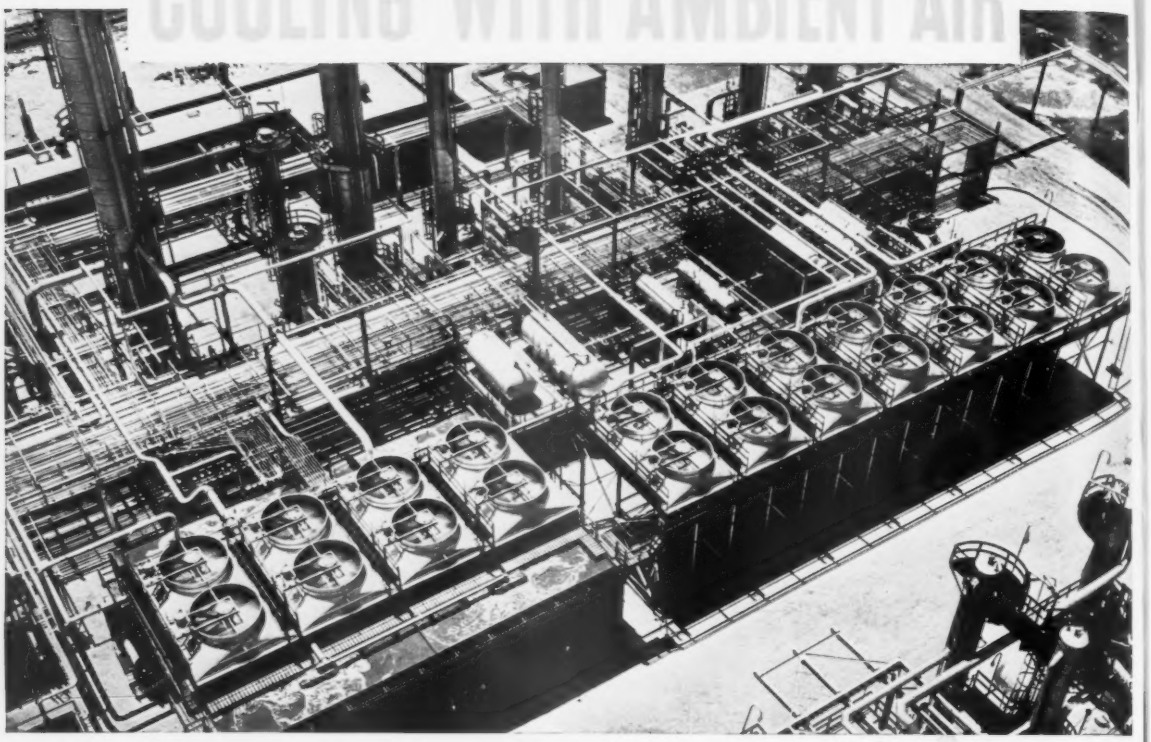

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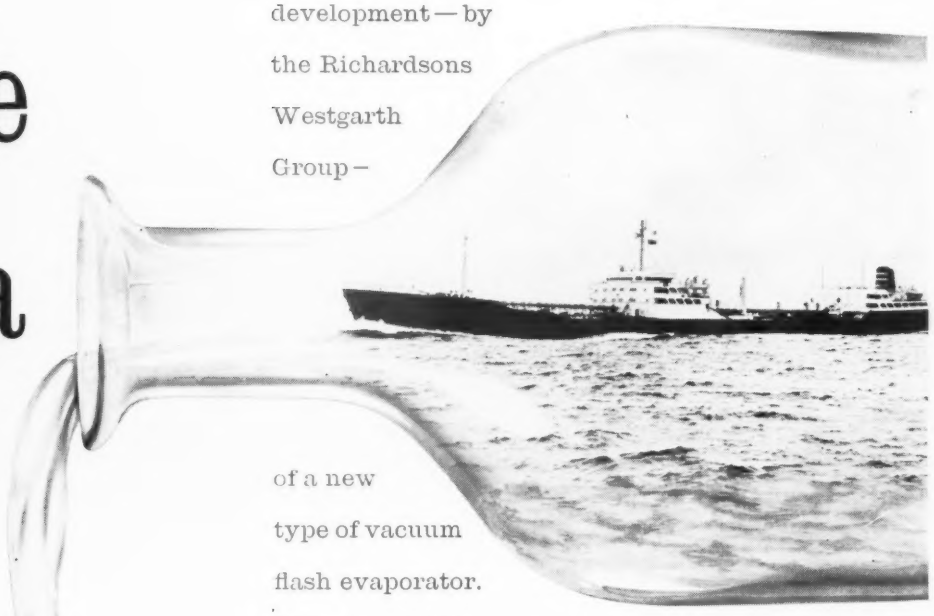

of a new type of vacuum flash evaporator. This remarkably compact, self-contained evaporator runs continuously, does not have to shut down at intervals for the removal of deposits, and is heated by steam at sub-atmospheric pressure (11 lb./sq. in. abs.).

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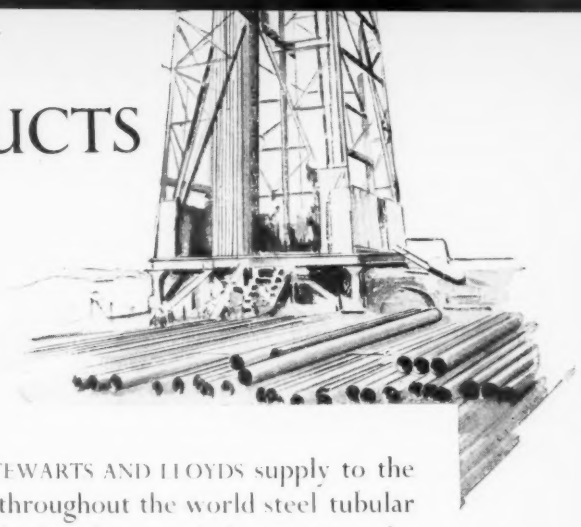

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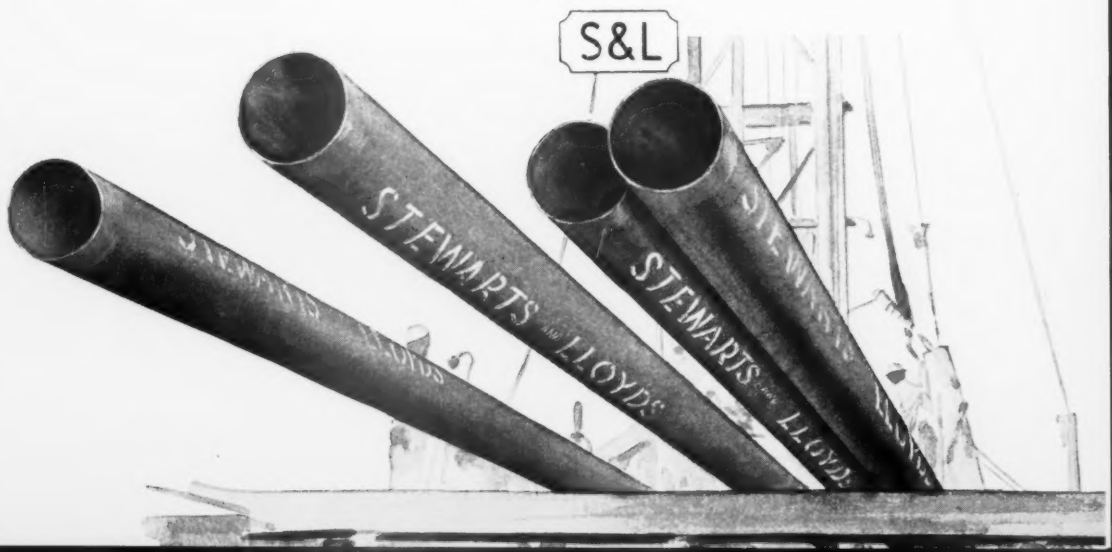

International NU-SWIFT News

No. 2

HAVE YOU MET THESE PEOPLE?

HAVE YOU BEEN TO THESE PLACES?

17. Since THE SUDAN gained her independence, the authorities have decided to standardize on Nu-Swift. The first orders have arrived from Khartoum.

18. In KUWAIT, fabulously wealthy Arabian oil-well state on the Persian Gulf, police and army cars are now all protected by Nu-Swift.

19. The SOUTH AFRICAN ELECTRICITY SUPPLY COMMISSION have decided to place Nu-Swift Dry Powder Extinguisher, Model 1604, on all their breakdown and service vehicles. The first orders have been placed.

20. In NIGERIA, Africa, which is shortly expected to achieve independence, TRAINS AND HOSPITALS are equipped with Nu-Swift. Climate is hot and humid.

21. BRITISH EXPORTS of fire extinguishers are the highest in the world. Total value of NU-SWIFT exports is increasing continuously. Last year they amounted to NEARLY ONE-THIRD OF THE BRITISH TOTAL.

22. In arctic SPITZBERGEN (Norwegian: SVALBARD), divided by an invisible iron curtain, but where Norwegian and Russian workers fraternize, the NORWEGIAN COLLIERIES of STORE NORDISKE SPITSBERGEN KULKOMPAGNI are protected by Nu-Swift.

23. THE ROYAL CANADIAN NAVY, which in 1947 standardized on the Nu-Swift Universal Water/Co_2 Extinguisher, has placed further orders.

24. HAILE SELASSIE, H.I.M. of ETHIOPIA, is reported to take a keen interest in fire extinguishers. Nu-Swift has been approved and the first consignments have been sent to ADDIS ABABA.

25. Since MOROCCO gained her independence, a Nu-Swift sales concessionaire has been appointed and the first supplies of extinguishers have been shipped to glamorous CASABLANCA.

26. Narrow and winding alleyways in the ancient town of ST. GEORGE, first British settlement in now fashionable BERMUDA, sometimes prevent the Fire Brigade from getting close enough for effective fire fighting. Fire engines are therefore fitted with extinguishers to enable firemen to fight inaccessible fires with reliable Nu-Swift.

27. A.T.A.C. the MUNICIPAL TRAFFIC COMBINE of the City of ROME, and reputed to be the largest surface passenger transport organization in Europe, has decided, after tests extending over two years, to standardize on Nu-Swift.

28. YUGO-SLAVIAN STATE-OWNED CORPORATIONS are among the Nu-Swift customers situated on the edge of the East-West iron curtain.

29. In HELSINKI, capital of gallant little Finland, and almost within a taxi ride of Leningrad, the FINNISH POSTS AND TELEGRAPHS DEPARTMENT have decided to standardize on Nu-Swift Dry Powder extinguishers, especially suitable for use under severe arctic conditions, common each winter in Northern Finland. Substantial orders have already been placed.

30. GERMAN SHIPOWNERS are now also able to fit Nu-Swift in their ships, thanks to the approval of the SEE-BERUFSGENOSSENSCHAFT in Hamburg.

31. At TULLN, Austria, in the presence of high ranking Austrian fire fighting officials, including BRAND-DIREKTOR DUFEK, Chief Fire Officer of Vienna, two Nu-Swift Dry Powder Extinguishers, Model 1604, bonded for 2 years for reliability tests were recently discharged. They passed with flying colours and OBERBRAND-RAT SPEIL, the official responsible, signed the certificate of approval on the spot.

32. The Government of the FALKLAND ISLANDS, British sheep farming colony in the South Atlantic, near Argentina, recently placed their first Nu-Swift order. Sheep vastly outnumber human inhabitants in the Colony, previously of great strategic importance, but GREASY WOOL has high fire risk.

33. INDEPENDENT TELEVISION AUTHORITY, always in keen competition with the BBC, is determined that programme transmission shall never be interrupted through preventible causes. All its stations are now protected by Nu-Swift.

34. Reputedly being let at £25 a day or more, NEW LUXURY SUITES on the top floor of the DORCHESTER, London's premier Park Lane Hotel, are protected by Nu-Swift.

35. The up-to-date works of ALFA ROMEO, the well-known motor car manufacturers in NORTHERN ITALY, have recently been equipped with Nu-Swift. Crash tenders too have been fitted with fast and reliable Nu-Swift.

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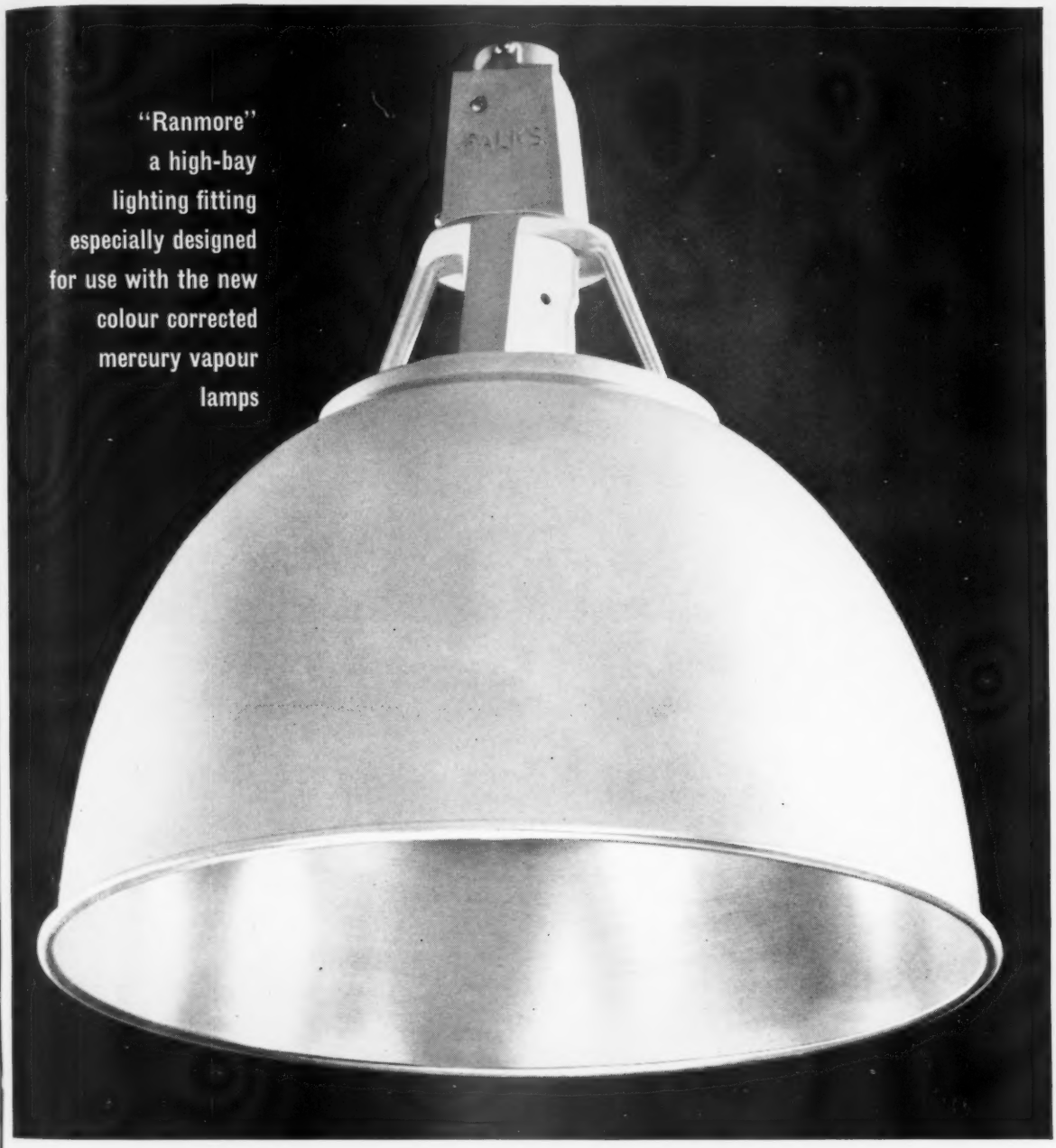

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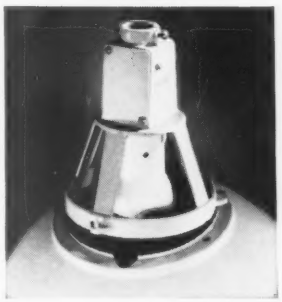

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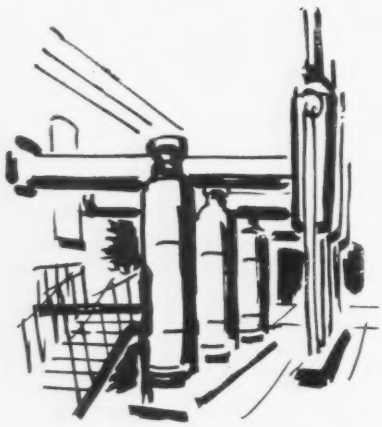

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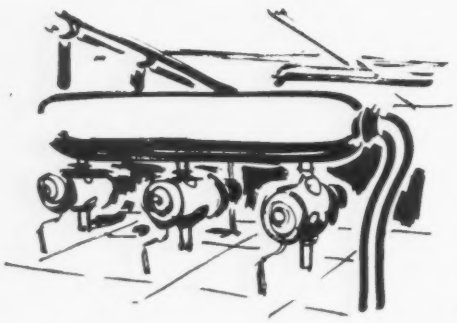

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THE INSTITUTE OF PETROLEUM
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Volume 14, No. 158 February 1960

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Iran's New Crude Oil Terminal

Kharg Island makes Pipeline History

Important throughout history, as records show, from as far back as 356 BC, Kharg Island located in the Persian Gulf about 125 miles from Abadan, has owed its former importance as a maritime and trading centre to its unique position. Once again the Island is to come into prominence, and this time for the worldwide export of Iranian crude petroleum. In 1957 the Iranian Oil Exploration and Producing Company decided to construct on Kharg Island a terminal to deal with the production of the Gachsaran oilfield. This new terminal will be Iran's second crude oil loading terminal, the first being at Bandar Mashur. Exports from Abadan are mainly of finished products.

The high-light in the connexion of Gachsaran to Kharg Island has been the laying of the 30-inch pipeline under the sea, first between Kharg and Khargu and then from Khargu to Ganaveh. The latter is the longest submarine line of this diameter yet laid and it was successfully completed in December last.

Another interesting point of this project is that the complete 99-mile line from Gachsaran to the Kharg Island jetty will constitute the longest gravity pipeline of its size in existence. Gachsaran is 2215 feet above sea level, the tank farm at Kharg being 200 feet above sea level. Pressure at the bottom of the sea line will be about 870 psi and this will be reduced at the tank farm to 250 psi.

Scheduled for completion this year, the complete project, including the development of Gachsaran, is estimated to involve a capital expenditure of £35 million.

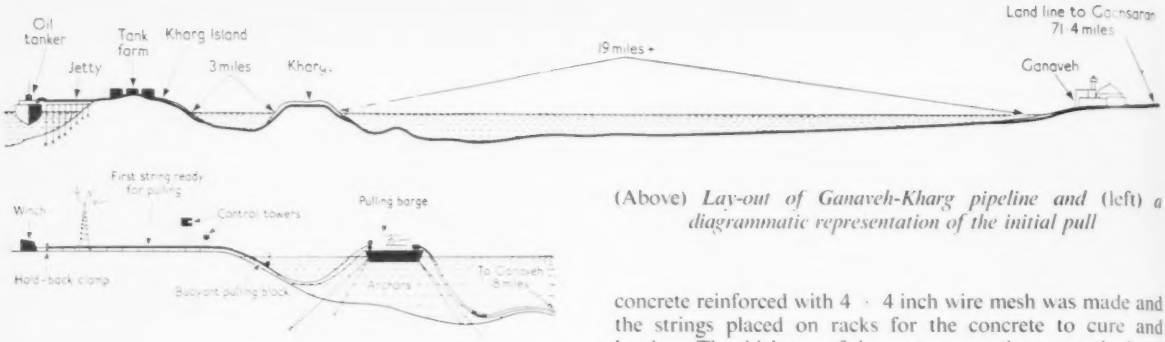
Oil was first discovered at Gachsaran in 1928, but it was not until 1940 that production started. The field is approximately 14 miles long and about 4 miles wide. A new 71-mile pipeline now connects it with the coast at Ganaveh. From here to Kharg Island the distance by sea is about 25 miles, the small island of Khargu intervening at 19 miles from the mainland.

The Submarine Line

The work of laying the submarine line was entrusted to International Marine Constructors CA (INMARCO), an affiliate of Collins Construction Company, of Port Lavaca, Texas. After extensive surveys to check all conditions, the Company decided that the line should be laid by the "continuous pull" or "friction transposition" method. By this method the pipe stays on the sea bottom from its entry at the shore line until it reaches its destination.

Khargu Island was selected as the starting point for the two pulls—one of three miles to Kharg Island and the other of 19

A general view of the construction camp on Kharg Island



(Above) *Lay-out of Ganaveh-Kharg pipeline and* (left) *a diagrammatic representation of the initial pull*

miles to Ganaveh. An overland section of 3 miles is required to join the two marine sections and, on Kharg Island itself, a land line of 3 miles will connect the sea line to the tank farm.

Stores and equipment were moved on to Khargu and a camp was set up to house staff and labour. The pipe is 30-inch outside diameter seamless pipe to API specification 5LX42, with a wall thickness of 0·5 inch and tested to 90 per cent yield strength. The whole 25 miles of it was delivered in 26-foot lengths, which were then welded into strings of 4400 feet for the short pull to Kharg and of 4000 feet for the big pull to Gavaneh. After welding, every weld was tested by X-ray and the pipe coated with coal-tar enamel and two wraps of fibre-glass, followed by a wrap of 15 lb thermoglass, total wrap thickness being 0·2 inch. Finally a 2½-inch coating of concrete reinforced with 4 · 4 inch wire mesh was made and the strings placed on racks for the concrete to cure and harden. The thickness of the concrete coating was calculated to give the pipe a negative buoyancy of 4 lb per foot when in the water.

Meanwhile, preparations for launching the line were active. The launching inclines were dredged, the launchway was erected, anchor blocks and winches were placed in position, and control towers and radio communications were completed.

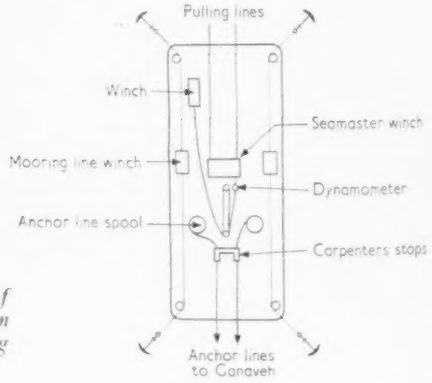
The launchway consisted of patented special rubber-tyred launching units set at 40-feet intervals to carry the pipe as it is launched into the water. This type of carriage eliminated any risk of the pipe coating being damaged.

Centre of the pulling operation was the control tower in direct communication with the pulling barge on which were installed the special Seamaster winch for pulling the pipe, together with equipment for placing the barge in the correct position for each pull and holding it there. Four anchors were also provided to prevent lateral movement and to ensure a straight pull on the pipe.

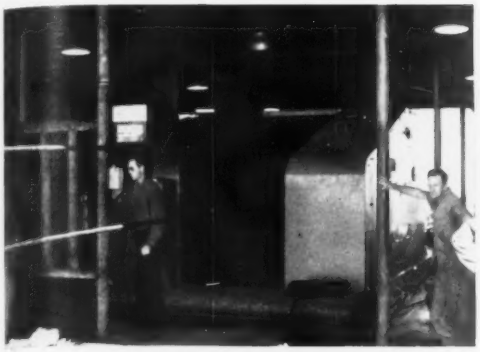
At the commencement of the pipe-launching operation, the first 4000-foot length of pipe was rolled on to the launching units, the landward end being held in a hold-back clamp and then attached through a block to a hold-back winch. This winch provided a restraining force of up to 10 tons acting against the forward pull of the pipe and the winch on the barge. To the nose of the pipe a pulling head had been welded, and to this a special buoyant pulling block was attached, the pulling lines from the Seamaster winch passing through this pulling block.

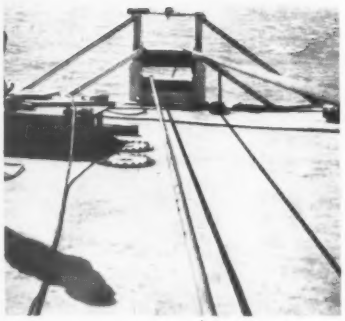
When the first string of pipe had been pulled into the sea, the strain was transferred to a standing hold-back in order to maintain tension on the pipe. A new length of pipe was then rolled into position, the wire from the winch being pulled back. The new length of pipe was then welded on to the main

General view of finished pipe and, on right, moulds being placed in position on a string of pipe ready for concrete pouring.
A Collins photo



Lay-out of equipment on the pulling barge





On the pulling barge. (Left) *The Seamaster winch and* (right) *the towing lines from the winch to the pipeline nose*

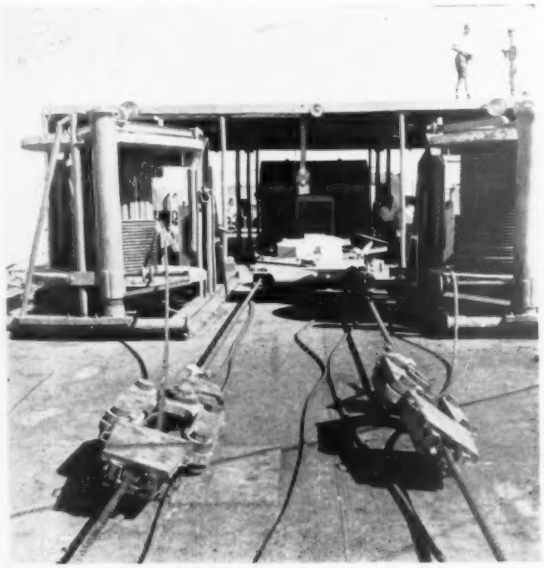
string, the joint examined by X-ray and covered with reinforced concrete. When the concrete was cured and the complete string attached to the hold-back winch, all was ready for the next pull as far as the pipe was concerned.

Meanwhile, the barge was being moved into a new position for the next pull. The anchor lines were reeled in on to special vertical spools at the same time as the pulling lines were paid out from the other end of the barge. Accurate location of the barge was controlled by radio through two Tellurometer stations on the shore and one on the barge. When the correct new position was reached, the two cables were locked in position by a pair of carpenters' stops and the anchors set to prevent any lateral movement.

All pipe-laying operations were controlled by two-way VHF-FM radio, and secondary visual light signals were also installed on the control towers on Khargu and at Ganaveh.

Gachsaran–Ganaveh Pipeline

In order to carry crude oil from Gachsaran to the coast a 26-28-30-inch pipeline has been laid from Dasht-i-Baloot to Ganaveh. It has an initial capacity of 330,000 bd, but provision is being made to increase this later by installing pumps or by looping the line. Total length of this line is 71·4 miles and its route is through desert as well as very rugged mountain terrain.



Simultaneously, production equipment has been modified. The No. 1 production unit has been increased in capacity to 150,000 bd and a second unit of the same size has been installed. Both have plants for removal of hydrogen sulphide and associated facilities.

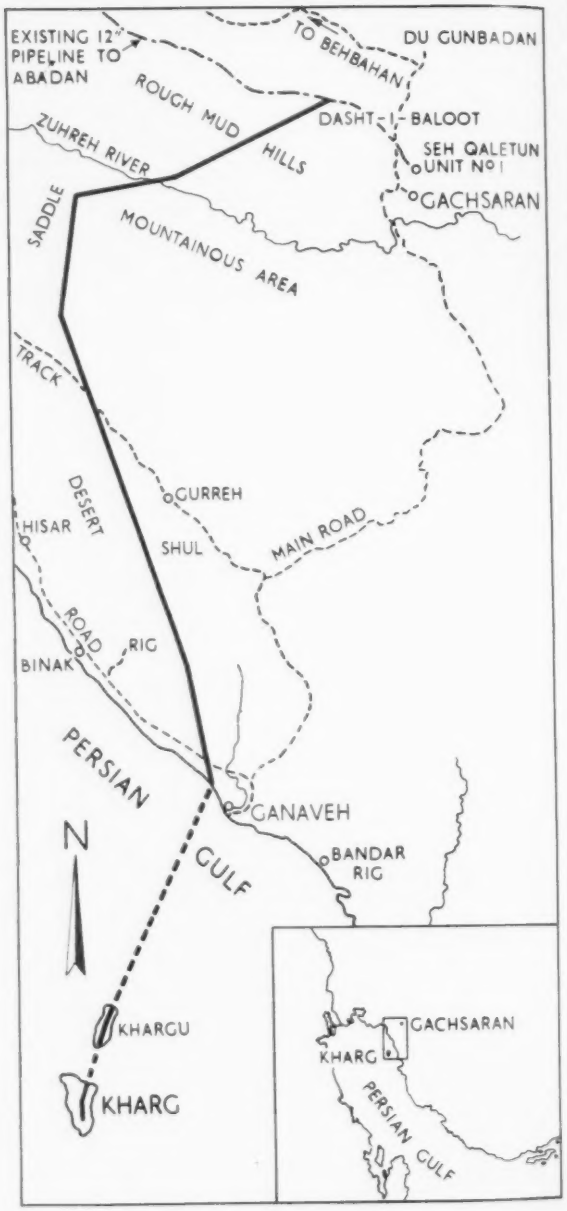
Kharg Island Terminal

Kharg Island is approximately 5 miles long and 2 miles wide. It is here that a large storage installation and up-to-date loading facilities are being erected to handle the Gachsaran crude oil production.

Oil Storage

Initially the crude oil storage capacity will be 2,728,000 barrels and consisting of eight 180 × 60-foot tanks (271,000 barrels each) and four 144 × 48-foot tanks (140,000 barrels each). The 180-foot diameter tanks are the largest oil storage

(Left) *The carpenters' stops on the anchor lines and the drums on which the anchor lines from Ganaveh are wound, and* (right) *the line entering the sea at Kharg, with the pulling barge in the far distance*
Photos by Collins



Courtesy of Iranian Oil Operating Companies, Tehran.

(Above) *Aerial view of Khargu with Kharg in the background, and* (right) *the route of the complete line from Gachsaran to Kharg*

tanks in the world. There is ample space available for considerable expansion in crude storage capacity when necessary. All crude oil tanks are of the floating roof type. All tanks have been welded by use of the shielded arc system.

The tank farm is directly connected to the end of the underwater line, a pressure-reducing station being installed to reduce line pressure to 250 psi as already mentioned. From the tank farm, which is 200 feet above sea level, there will be two 36-inch lines down to the jetty. These latter will enable loading rates of up to 5000 tons per hour to be achieved.

A separate tank farm has been provided for bunkers and at first will provide storage for 280,000 barrels of fuel oil in two 144 × 48-feet tanks and 58,000 barrels of diesel fuel in one 100 × 42-foot tank. These tanks have fixed conical roofs, and space has been reserved for additional tanks as needed.

Jetty

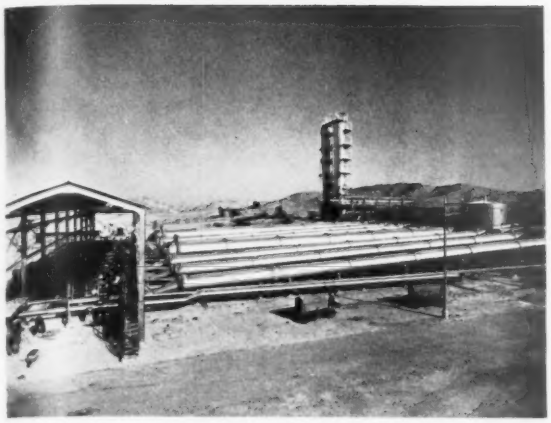
Work is proceeding on the construction of a four-berth jetty on the east side of the island. A water depth of 60 feet at the jetty head will enable the largest tankers at present visualized to be handled. Two 100,000-ton tankers can be accommodated at one time. Loading operations will be controlled from a central control room which will direct oil flow through the complete system from Gachsaran to the vessel being loaded.

A causeway 1485 feet long and 140 feet wide at the top has been built out from the shore, local stone having been used for its construction. From the causeway, a 2350-foot trestle is being carried out to the jetty head and will provide room for pipe tracks and a road for vehicles. The jetty head, at a right angle to the end of the trestle and to the south, will be 2000 feet long and 120 feet wide. The piles for the trestle and jetty are of Rendhex design, over 500 No. 3 type and 125 feet long having been used for the trestle. For the jetty over 1000 No. 4 piles 135 feet long have been used.

The jetty will be fully equipped with four banks of Chiksan hydraulic marine loading arms manufactured by The Oil Well Engineering Co. Ltd, of Stockport. Three of the banks will be equipped with five 12-inch 52-foot metal arms, the fourth having four similar arms. All arms on a bank can be operated from a single control room and will accommodate a 50-foot rise and fall of ship and a fore and aft drift of 25 feet.

When expansion becomes necessary a second jetty head can be constructed to the north side of the trestle.

To provide a small boat harbour, a breakwater arm 1400 feet long has been built out from the end of the causeway and the area dredged to 20 feet below low water level. The breakwater is 34 ft 6 in wide on top.



Courtesy Iranian Oil Operating Companies, Tehran.

Production unit at Gachsaran

Essential Services

To successfully operate a crude oil loading terminal of the size of Kharg Island installation requires a full range of essential services. These include accommodation for staff and labour, water, power, communications, and so on. When construction of the pipeline and terminal was commenced in 1957 no such facilities existed on the Island and temporary facilities had to be provided for the construction period. Not only had all material, equipment, and personnel to be brought in by sea or air but accommodation had to be provided for approximately 2500 persons.

Permanent services for operations and staff are now installed or under construction and are outlined below:

Power Supply. It is estimated that for the needs of the loading terminal and to supply the staff community only will initially require a peak load of 1500 kW, while future requirements may rise to 3400 kW.

To cater for this load the power station will be equipped with three sets each consisting of a 1064 kW Brush alternator driven by a Mirrlees type KSS6 1508 bhp 6-cylinder turbo-charged engine. Current will be generated and distributed to main centres at 11,000 v.

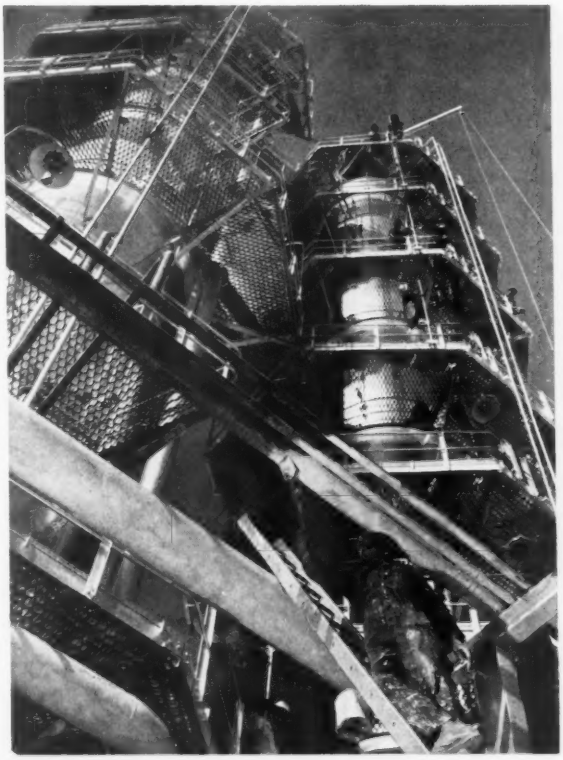
Diesel fuel or Gachsaran crude oil will be used by the engines.

Water Supply. It is estimated that to supply only the needs of the industrial area and of the operational staff will require about 100,000 US gal per day of drinking water and 200,000 US gal per day of untreated water. This does not include water supply to tankers, which will only be provided in an emergency.

The daily water requirement of 300,000 US gal per day will be obtained from two Richardsons Westgarth vacuum-flash evaporators, each having a daily capacity of 150,000 US gal with a gained output ratio of 5·25:1. The plant is complete with two packaged boilers, all switchgear, and equipment for ensuring the potability and sterility of the water. Two 500,000 US gal tanks will be used for water storage. Distribution will be by gravity.

Courtesy Iranian Oil Operating Companies, Tehran.

The Gachsaran-Ganaveh pipeline



Courtesy Iranian Oil Operating Companies, Tehran.

Plant for removal of hydrogen-sulphide from crude oil at Gachsaran

Communications. During the construction period transport of personnel and small stores from Abadan has been by a DC-3 regular service. For this purpose a 3000-foot temporary airstrip with a 100-foot wide runway and 100-foot shoulders has been used. A longer permanent airstrip with a runway 150 feet wide and with 175-foot shoulders is being prepared. Two helicopters are in regular use for quick transport between Kharg, Khargu, and the mainland and for survey over the pipeline to Gachsaran.

(Left) *Causeway, small boat harbour, and trestle to jetty under construction and* (right) *pipe track alongside the trestle*

Barges and seagoing launches and tugs will be stationed in the boat harbour to carry stores from Abadan and for transport to the mainland. A radio telephone service also provides communication with the mainland.

Housing. In the early construction period staff and labour were housed in tents, but later the labour staff were housed in ten barrack-type structures each holding 100 persons.

For the housing of permanent staff and labour considerable use will be made of prefabricated houses, some of which are already in use. Thus there are 12 houses for married staff, six of which have two bedrooms and six have three bedrooms. Thirty-eight temporary buildings, each having three bedrooms, lounge, kitchen, etc. have been used by bachelor staff during the construction period but are to be converted to permanent married staff quarters. A guest house and club are now in use and were found to be very comfortable.

For junior staff, twenty concrete block quarters will be provided and 120 labour houses are being erected.

Garages, shops, a cinema, and all that is needed to convert an isolated island into a residential area will complete the picture.

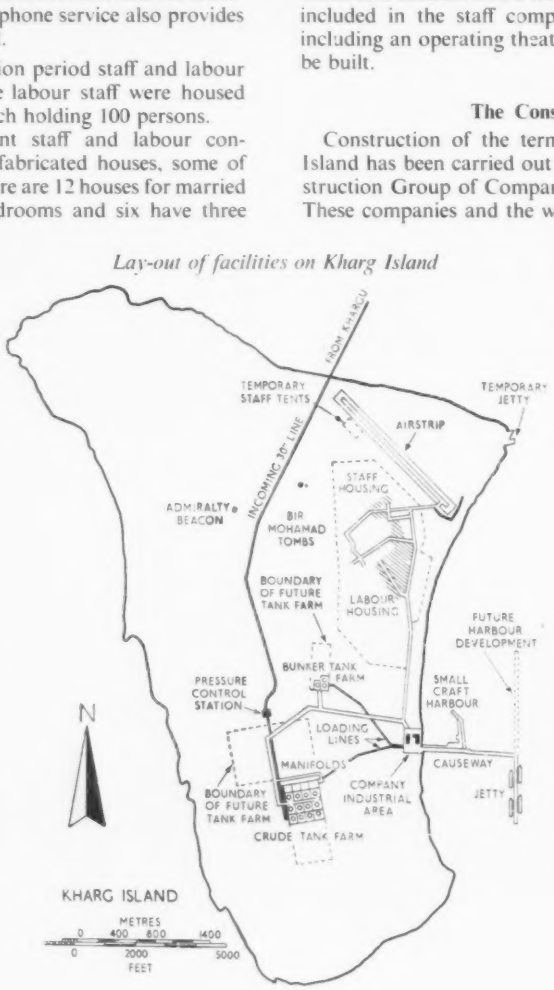
All the prefabricated buildings are of British manufacture, having been supplied by Coseley Buildings Ltd (Wolverhampton) or W. J. Simms, Sons & Cooke Ltd (Nottingham). It is of interest to record, that when the ship carrying the first consignment of these buildings caught fire and sank, a complete replacement was shipped in less than a month.

Medical Services. Essential medical services have been taken into account and a resident doctor and nursing staff are included in the staff complement. A hospital and clinic, including an operating theatre for emergency operations, will be built.

The Construction Force

Construction of the terminal and all facilities on Kharg Island has been carried out by members of the Iranian Construction Group of Companies and by a number of others. These companies and the work executed or planned are:

Lay-out of facilities on Kharg Island



Bredero's Bouwbedrijf NV* (Dutch):
Commissary; staff and labour housing; guest house and staff club; staff mess and labour mess; hospital; temporary general offices.
Roads, sewers, and culverts.
Tank foundations and bund walls; sleepers and anchors for pipelines; power station foundations.
Ice plant; crushing plant.
Temporary stores and yards; permanent offices and workshop.

Constructors John Brown Ltd* (British):
Evaporation plants and off-loading of material.

Richard Costain (ME) Ltd* (British):
Temporary jetty and camp facilities.
General labour administration; local contracts; food supplies; material handling.
Fill for small boat harbour.

International Marine Constructors CA (American):
Kharg-Ganaveh pipeline.

Overseas Dredging Co. Ltd (British):
Dredging of small boat harbour.

Raymond International*-Costain* (American-British):
Construction of jetty.

Courtesy Welding Supervision Ltd.

The tank farm and the pipeline from Ganaveh

Welding Supervision Ltd (British): Inspection of all welding and coatings; safety precautions.

Werkspoor NV* (Dutch): Temporary and permanent power stations; lighting and power facilities; telephone facilities; water lines. Kharg Island pipeline; oil storage tanks.

Williams Bros*—C.J.B.* (American-British): Gachsaran-Ganaveh pipeline.

*Members of Iranian Construction Group.

Courtesy Welding Supervision Ltd.

Pipe work on the inter-tank manifold

Courtesy Constructors John Brown Ltd.

General view of the construction camp

Acknowledgment

The Editor of the *IP Review* is indebted to the Iranian Oil Operating Companies for the opportunity to visit Kharg and Khargu islands during the pipe-pulling operations. He also thanks those members of the staff in Iran and on Kharg Island who spared no efforts in explaining the operations and construction work being carried out.

Among the personnel met on Kharg Island were (left) *Frank Maliphant* (site manager) *and Nick Vermuellen* (construction engineer); *and* (right) *the dynamic Sammy Collins and Emmerson Kailey* (Collins Construction)

Around the Branches

ABADAN, BAHRAIN, ESSEX, FAWLEY, KUWAIT, LONDON, NORTHERN, SCOTTISH, SOUTH-EASTERN, SOUTH WALES, STANLOW, TRINIDAD, YORKSHIRE

Essex Branch

A meeting of the Essex Branch of the Institute was held on 18 November, when E. M. Goodger, M.Sc., Ph.D., A.M.I.Mech.E., A.F.R.Ae.S., F.Inst.Pet., dealt with the subject of "Liquid Fuels for Rocket Propulsion."

Mr Goodger's talk was extremely interesting, covered a wide range of materials in masterly style and was well supported with demonstrations. Some laboratory chemists enjoyed the thought that reactions they had never been allowed to perform themselves, such as mixing aniline and nitric acid, were carried out frequently in some establishments, and that in fact such explosive combinations are dignified by the name of hypergolic pairs.

The unusual properties of some of the slurries also excited interest, for example the almost animal way the aluminium slurry flowed out of its container and back into it in a way that a well-behaved hydrocarbon mixture such as petrol could not achieve.

It was reassuring to discover that hydrocarbon fuels still represent the practicable compromise for rocket applications after the widely-differing types of materials that had been mentioned during the lecture.

The Essex Branch was addressed by W. D. Carson, N.D.A., N.D.D., of Fisons Ltd, on 16 December. He dealt with the subject "The Farmer Demands . . . ", which proved of considerable interest to his audience not only because of its intrinsic importance but because of the plants for making nitrogenous fertilizers that were being constructed in the neighbourhood.

The talk was illustrated both by slides and film and it was a revelation to many that the similarities between the oil industry and the fertilizer industry were so frequent. Mr Carson developed this theme in a light-hearted manner, starting with the first fertilizer factory of 1857 in Suffolk which just preceded "Colonel" Drake's oilwell in 1859. From superphosphate to potassium and to nitrogen provided an interesting story, with the development of the German industry based on potassium and the rise of the Chilean saltpetre market. Then followed ammonium sulphate from the gas works and the fixation of atmospheric nitrogen, which has had such a profound effect on man's ability to make two blades of grass grow where one grew before. It was pointed out that the Industrial Revolution, which resulted in the importation of cheap foodstuffs, had put the British farmer in a difficult position, and despite some alleviation in the first world war, by 1930 British farming was in a hazardous position. The increasing utilization of fertilizers of all types which was sparked-off in this way had continued unopposed. Just as the modern gasoline was a cocktail, so fertilizers might contain additives leading to improved performance in agricultural husbandry.

A merry discussion was initiated by Mr Bartholomew, who was interested to find that farmers wanted to grow clover, whereas he wanted to stamp it out of his lawn. By the end of the evening many of the local oil men had a better appreciation of some of the problems facing a modern "farmer's boy."

Northern Branch

At a meeting of the Northern Branch held in the Engineers Club, Manchester, on the 17 November, 47 members heard W. Pohl give a talk entitled "Standard Methods". Mr Pohl is a member of Standardization Committee and chairman of Sub-committee C (Lubricants and Waxes). The chair was taken by T. G. Provest, the branch chairman.

The speaker began by describing the recent changes in the organization of the IP Standardization Committee and discussing the relationship of the Committee with other standardizing bodies in the U.K. and abroad. Mr Pohl pointed out that there were 417 individuals serving the committee through its sub-committees and panels, and that the IP relied, for its experimental work, on the laboratory facilities which these individuals and their companies were willing to place at its disposal.

After describing the organization and integration of the work of the sub-committees and panels, Mr Pohl went on to discuss in detail the work of his own sub-committee, Lubricants and Waxes, and dealt at length with the problems being currently investigated by the panels. He drew attention to the fact that of the 170 Methods listed in the 1959 Edition of *Standard Methods*, 34 were declared obsolete, and of the remaining 136, 14 bore a 1959 designation, whilst only 33 bore year designations prior to 1955.

The meeting closed after a period for questions, the number of which indicated the members' interest in this subject. A vote of thanks was proposed by the chairman.

London Branch

Fish or fishing appeared to be the theme on which the London Branch annual film show, held on 4 and 11 December 1959, was based. Two of the films at each event were certainly on these subjects. The first, which dealt with the spawning of the red sockeye salmon, is the first record in colour of this happening and is part of a longer film titled *The Great Country*. It was shot by Edgar Queeny, the president of Monsanto Chemical Company. Indeed a remarkable record excellently photographed.

The second film, also in colour, took the audience on the maiden trip of the Aberdeen great-line fishing vessel into the Arctic Circle. Titled *Hook, Line, and Sinker*, it is the first screen record of this method of fishing—and the fine giant halibut which were hauled inboard. An Esso production.

The London Branch Film Show

Shown on both evenings was also *Schlieren*, a Shell film demonstrating a basic principle of the behaviour of light and the use of this principle in research and manufacture. A fascinating and interesting study.

On 4 December the fourth film was *The Energy Picture*, a BP colour cartoon film depicting man's insatiable demand for power throughout the ages. The story is followed from the era of simple power to the nuclear age, oil's part in the story being covered from exploration to marketing. This film was replaced on 11 December by another BP film *Giuseppina*. Taken in Italy in the Spring of 1959, it tells the story of a small filling station in that country as seen through the eyes of a little girl. A really charming and moving story.

The chairman of the Branch expressed the thanks of the Branch to BP, Esso, Monsanto, and Shell for the loan of the films, and to Shell-Mex and B.P. for the use of the theatre in Shell-Mex House and for the provision of refreshments. The accompanying photographs are typical of scenes in the refreshment room.

Personal Notes

The Iraq, Basrah, and Mosul Petroleum Companies announce the appointment of **N. M. Ekserdjian, N. Y. Ruth,** and **L. R. Murphy** as executive directors of the companies.

N. M. Ekserdjian joined the management of the Companies on 1 February 1959, and is responsible for relations with Governments, concessionary matters, and personnel policy. He is a graduate of the London School of Economics, where he took an Honours Degree as Bachelor of Commerce.

N. M. Ekserdjian

From 1935 until the outbreak of the second world war he was employed in the electrical industry, with the British Thomson-Houston Company. After a distinguished war record he worked with the United Nations as UNRRA's chief executive in Italy and later at headquarters in Washington. In 1949 he joined the Gulbenkian interests, and as an alternate director of the Iraq Petroleum Company and associated companies, representing Participations and Explorations Corporation, acquired an intimate knowledge of the affairs of the Companies.

Nelson Y. Ruth joined the Iraq Petroleum Company and associated companies in August 1959, with special responsibility for exploration and production.

Nelson Y. Ruth

A graduate of Oklahoma State University with a Bachelor of Science degree, Mr Ruth also attended the Advanced Management Programme at the Harvard University Business School in 1949. His long experience of the oil industry dates from 1927 when he joined the Exploration Department of the Carter Oil Company—an affiliate of the Standard Oil Company (New Jersey). In 1953 he became a director of the Carter Oil Company for exploration, production, research, and field operations.

In 1954 he joined the Standard Oil Company (New Jersey) as assistant co-ordinator of Producing Co-ordination and was concerned with their world-wide production activities. When the Jersey Production Research Company was organized in 1958, Mr Ruth was appointed a director.

L. F. Murphy joined the Iraq Petroleum Company and associated companies in October 1959, with special responsibility for financial aspects of their affairs.

L. F. Murphy

Mr Murphy, a graduate of the University of London with a Bachelor of Science degree, entered the civil service in 1934, and served successively in various ministries, including the Ministry of Fuel and Power, where he became an assistant secretary in the Petroleum Division.

He joined the London office of the Socony Mobil Oil Company Inc in 1952 and was initially responsible for the financial aspects of Socony Mobil's operations in the sterling area, and subsequently taking charge of the supply and marine transportation activities as well. In 1955 he became chairman of Mobil Supply Company Ltd and Mobil Shipping Company Ltd, and managing director of Mobil Services Company Ltd.

G. W. Powell has been appointed a managing director of Esso Petroleum Company Ltd, with effect from 6 January.

Aged 56, Mr Powell has been a member of the Esso board since 1957.

Educated at Charterhouse and Cambridge University, he joined the Company in 1923, and after serving in a number of important positions on the marketing side, was appointed general manager (marine) in 1954.

From 1939–48 Mr Powell also served with the Petroleum Board as manager of the South-West Region. His father, the late F. E. Powell, was chairman of the Anglo-American Oil Company from 1912–31.

G. W. Powell

M. W. Johnson has been appointed co-ordinator of the world-wide marketing activities of Standard Oil Company (New Jersey), succeeding **D. W. Ramsey** who has joined Humble Oil & Refining Company as vice-president and director. **G. W. Butler,** assistant general manager of marketing for Esso Standard Oil Company, succeeds Mr Johnson as deputy co-ordinator of marketing.

Mr Johnson majored in mechanical engineering at Purdue University, and began his career in 1928 in New York and shortly after joined a SONJ affiliate in the Caribbean area. In 1938 he was made a division sales manager of West India Oil Company, now known as Esso Standard Oil SA, and in 1942 became general manager of the Company's Panama regional office. In 1948, Mr Johnson was elected president and a member of the board of directors of Esso Standard do Brasil Inc, a post he held until his appointment as Jersey's deputy co-ordinator for marketing in 1958.

Mr Butler joined Esso Standard Oil Company in 1929, and for 23 years served in various posts in various north-east sales divisions. From 1953–56, Mr Butler was manager of the New Jersey sales division, leaving that post to join Standard Oil Company (New Jersey) as manager of the marketing development division and, later, as assistant co-ordinator of marketing for North America and Africa. He returned to Esso Standard as assistant general manager of marketing in 1958.

A. H. Simpson

A. H. Simpson, formerly general sales manager of Shaw-Petrie Ltd and Clyde Tube Forgings Ltd, has been appointed commercial manager of Woodfield Rochester Ltd.

Mr Simpson will act as deputy to R. H. Corbett, director, in relation to the latter's sales responsibilities.

D. W. Kent, sales manager of Causeway Reinforcement Ltd, is on an extensive tour of the Middle East. Mr Kent is spending approximately eight weeks visiting oil refineries and installations.

Kenneth Fidler has been appointed manager of the South-East London Branch of Shell-Mex and B.P. Ltd.

He was formerly a manager in the London Divisional office, and in 1954–58 was manager of the Communications Department at Shell-Mex House.

J. C. FitzGerald has been appointed a member of the board of directors of Bataafse Internationale Petroleum Mij NV. Also, **H. William Slotboom** has been appointed a member of the board of directors of Shell Internationale Research Mij NV.

In addition, Messrs FitzGerald and **D. de Bruyne** have each been appointed general attorney of Bataafse Petroleum Mij NV.

C. M. Merrick, managing director of Petrofina (Gt Britain) Ltd, becomes chairman of the Company in addition to his other position, and **E. Roberts** has been elected a director.

F. J. Slee has retired as joint lubricants manager, Shell-Mex and B.P. Ltd, after 36 years' service, during which he played a big part in the development of the Company's lubricants business, particularly in the sphere of industrial lubricants.

F. J. Slee

A graduate of both Cambridge and London Universities, Mr Slee's early experience was with the Air Ministry's oil laboratories, and in the general engineering and road haulage businesses. He joined Shell-Mex Ltd in 1923 as a general oil salesman, and subsequently served in the Company's head office. Since 1946 he had been joint manager of the Lubricants Department of Shell-Mex and B.P. Ltd.

L. H. Coney, who joined Mr Slee as joint manager of Lubricants Department in 1954, is now the manager of the Department.

J. A. Hepworth, B.Sc., M.Inst.Gas.E., has been appointed chief engineer of the North Thames Gas Board in succession to **Dr J. Burns,** who becomes deputy chairman of the Board.

J. A. Hepworth

Mr Hepworth was educated at Leeds University, where he studied under the late Professor J. W. Cobb. After graduating, he joined the former Gas Light and Coke Company in 1922 as a junior assistant engineer at Beckton gasworks. After service at several of the Company's works, he was, in December 1940, appointed station engineer at Stratford, London, and later at Kensal Green. In 1949 he was appointed group engineer in charge of the Board's eastern group of gas-making stations, and in June 1952 was appointed deputy chief engineer.

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PROGRESS AT KIMMERIDGE

A second test well is being drilled near Kimmeridge in Dorset, by BP Exploration Company. This well is some 2500 ft west of Kimmeridge No. 1 well, where a show of oil was encountered at a depth of about 1800 ft in limestone last March.

The No. 1 well has undergone a prolonged production test. A production wellhead has been fitted and two tanks have been erected in which the crude oil was collected and the gas vented off. The oil was taken by road tank wagon to Wareham Station where it was transferred to rail tank cars for carriage to BP's Pumpherston refinery in Scotland to be processed and tested.

It is planned to drill a third and possibly a fourth test well at Kimmeridge. While the original show of oil was encouraging, much work is still required before it can be known whether it is likely to prove commercial.

Notes of the Month

Venezuelan Treasury Bills' Announcement

Compañia Shell de Venezuela Ltd has agreed to participate in an arrangement concerning the issue of Venezuelan treasury bills. This is in line with the announcement made by the Finance Minister, Dr. José Antonio Mayobre, on 24 November, in his outline of the economic and financial state of the country.

The mechanism by which this arrangement will be effected is that the treasury bills will be taken up by certain New York banks which will buy them through the agency of the Central Bank of Venezuela, paying for them in dollars.

This purchase has been arranged by the oil companies who have undertaken in turn to purchase these bills from the banks in question on the dates of their respective maturity and who will then present them for redemption in Bolivars to the Central Bank.

Compañia Shell de Venezuela much appreciate the words of the Minister of Finance on behalf of the Government in announcing the collaboration of the oil companies and takes this opportunity to confirm that its participation in this matter may be regarded as an expression of confidence in the economic future of Venezuela.

Two Refineries for the Malayan Peninsula

A survey team will leave shortly for the Malayan Peninsula to investigate suitable locations for two oil refineries there—one in the State of Singapore for the Shell Company of Singapore Ltd, and the other in Malaya for the Shell Company of the Federation of Malaya.

The Singapore refinery, which will cost about £4·6 million, has been the subject of discussions with the Singapore Government, and official application has been made to the Minister of Finance for pioneer status for this project.

A detailed economic study of the refinery projected for the Federation of Malaya was made early in 1959 and discussions with the Federation Government have been in progress for some time. Official application for pioneer status for this project has also been lodged with the Malayan authorities. This plant will cost about £7 million.

Both refineries will be designed to meet Shell's present and future local requirements of principal petroleum products.

Upon completion, the refineries will give permanent employment to several hundred Federation and Singapore nationals and train them in the techniques of refinery operations.

Shell to Explore in Belgium

Bataafse Petroleum Maatschappij NV has applied to the Belgian Government for an oil and natural gas exploration and development permit, covering an area of 263,000 hectares in southern Belgium.

The region comprises the southern part of the province of Hainaut, the centre of the province of Namur, and the western parts of the provinces of Liège and Luxembourg (Belgium).

If the permit is granted by the Belgian Government, BPM intends to assign its rights under the permit to Belgian Shell SA, or to another Belgian company which would have the full support of the Group. A survey of the area—which has a particularly complicated subterranean structure and where, so far, there has never been a systematic search for oil—will then start as soon as possible.

Esso Concession in Greece

The Greek Government and Esso Hellenic Inc, a U.S. corporation wholly-owned by Standard Oil Company (New Jersey), have signed an agreement granting the corporation exploration and development rights in certain areas of Greece. The agreement must now be ratified by the Greek Parliament.

Operations of the corporation will be conducted on an area of approximately 4000 sq km located in the general area of the islands of Paxi and Zakynthos, off the south-western coast of Greece, and in the areas of Killini and Pylos in western Peloponnesia.

It has been agreed that the corporation will spend a minimum of $6·4 million if operations are continued over the first eight years. If at the end of eight years no discovery has been made, the entire area will be surrendered to the Greek State. The duration of the development concessions, to be selected by the corporation in case of discovery, will be thirty years with the possibility of a ten-year renewal.

This agreement represents a 50-50 venture in which the Greek State will receive 50 per cent of the net profits of the corporation, including a royalty of 12½ per cent.

NIOC Drilling Activity

Latest reports from the National Iranian Oil Company indicate that drilling operations are continuing satisfactorily in the Central Alborz area. By the first week of December Sarajeh No. 3 had reached a depth of 8658 ft, and a plug had been set at 7964 ft. Sarajeh No. 4 had reached a depth of 10,007 ft. Fishing operations for stuck drillpipe at 9923 ft on Alborz No. 8 have been successfully concluded, and drilling will be continued. The stratigraphic well at Gorgan No. 1 has reached a depth of 3580 ft.

SIRIP No. 1 well in the off-shore concession of the Société Irano-Italienne des Pétroles in the Persian Gulf reached a depth of 6260 ft in the first week of December. Heavy snowfalls have interrupted the drilling of the SIRIP well located on top of Mount Sequta in the Zagros agreement area: the crews were snowbound at the well, which had reached a depth of 613 ft by early December.

Satisfactory progress is reported in the drilling of the Iran Pan American Oil Co.'s off-shore well, a depth of 7474 ft having been achieved at the time of the report.

Crude oil production at Naft-i-Shah oilfield in the first ten months of 1959 reached a total of 1,591,678 brl, an increase of 0·45 per cent over the corresponding period of 1958.

Persian Natural Gas Pipeline

Work is progressing on the clearing of the right of way for the 140-mile, 10-inch, natural gas pipeline which is to supply gas from the Gach Saran field to major industries at Shiraz.

Pipelaying operations on the first section of the line, between Shiraz and Marvdasht, have begun. A fertilizer plant is under construction at the latter town, which is 25 miles north of Shiraz. The extension of the pipeline from Gach Saran to Shiraz will start in February of this year.

The gas treatment plant will be situated near Ab-i-Shirin, 3 miles north-east of Gach Saran.

Marine Seismic Survey off South Coast of Britain

During November exploration for oil in Britain was carried a stage further by a marine seismic survey in the waters off the south-west coast of the Isle of Wight. Its object was to investigate the nature of the geological structure beneath the sea bed, for it has long been known that the anticline on this part of the island's coast is of the kind in which oil is sometimes found and that it may extend some way out to sea. The results of this study will influence the decision as to whether or not to drill for oil on land in this part of the Isle of Wight.

This is the third marine seismic survey to be undertaken on behalf of The British Petroleum Co. Ltd in the U.K. by Seismograph Service Ltd. The first two were completed in 1956 when the *Seislim*, a specially-converted corvette of 1100 tons, was used for the work in Robin Hood's Bay off the Yorkshire coast, and later off Swanage and Lulworth Cove.

For the Isle of Wight survey two smaller chartered boats were used, primarily to enable the survey lines to be taken closer in-shore, and the instruments needed were installed in a motor fishing vessel. The charges of dynamite were exploded below the surface of the water, along a series of parallel lines and one intersecting line, varying from $1\frac{1}{2}$–$3\frac{1}{2}$ miles in length, about eight shots being fired in every mile.

The procedure is that the motor fishing vessel sails on a steady course to its selected shot point, which is checked by Decca navigation equipment. The selected course with its shot points is marked out on squared paper, and a special pen, filled by a hypodermic syringe, then tracks the actual course of the ship so that any deviation is immediately apparent. If this part of the equipment fails, another Decca instrument provides a double check, flashing red lights if the ship is off course. When within sight of the shore, a third check is made with a sextant.

The cable is paid out at the beginning of the firing line. When the shot point is reached, the ship is stopped and the team in the motor boat which holds the dynamite link the latter to the cable and it is kept afloat by a balloon. As soon as it is fixed and primed, and the shooting boat out of the area, the charge is fired by cutting off a continuous sound signal sent out by the wireless set in the hold of the fishing vessel. As soon as this signal is cut off, electrical contact is made and the charge is fired.

The shooter at his controls in the motor fishing vessel

Paying out the cable from the motor fishing vessel

The geophysical team in this operation was led by Idris Bourne, a former member of BP, and the owner and skipper of the ship, a mariner with forty-two years' experience of Britain's coastal waters. An old hand at the job, he has been in charge of seismic operations on land in the Middle East and Europe, and in African rivers.

It would have been ideal to complete this seismic programme during the summer but it was delayed in deference to the feelings of the lobster fishing community who feared that their catch might be affected if there were explosions off the Isle of Wight during the lobster season. This meant that Seismograph Service had to contend with the worsening weather and mounting seas of late autumn. Several times the vessels sailed out past the Needles only to be turned back by heavy seas. The motor fishing vessel rides very well but in rough weather the operation of paying out and taking in the heavy cable is made almost impossible and the little shooting boat with its cargo of dynamite is tossed about like a cork, so that the charge cannot be floated, and the noise of wind and waves almost completely blocks out the seismic recording. During the first fortnight of November many anxious minutes were spent each night and early morning in listening to the forecasts of the weather experts.

After the completion of the Isle of Wight operation BP extended its marine survey to Kimmeridge Bay. It was in this area that the *Seislim* marine survey was made in 1956. The purpose of this survey is to determine the seaward extent and shape of the anticline on this part of the Dorset coast, where drilling has already led to oil production which may well be on a commercial scale, and to the first indication of such an oil accumulation in the Jurassic. A marine seismic survey is also planned off Ringstead in Dorset.

Launch of SS "Ellenga"

The 37,000 tons dw oil tanker *Ellenga*, building at the Wallsend shipyard of Swan, Hunter & Wigham Richardson Ltd, for British India Steam Navigation Company Ltd, was successfully launched on 1 December.

The *Ellenga* is the second of three tankers of this class building with the Wallsend yard, and will commence service this year under charter to The British Petroleum Company Ltd.

New U.K. Mobile Off-shore Platform

A mobile oil drilling platform, the second to be constructed in the United Kingdom, left Wallsend-on-Tyne on tow on 9 January. Built for Shell by Clelands Shipbuilding Co., the *Triton* as she is called, was designed by Bataafse Internationale Petroleum Mij, in conjunction with De Long Ltd who, as main contractors, have been responsible for engineering and supervision of construction. Initially she will be towed to Cardiff where she will be berthed until preparations have been made for her reception at a selected drilling location overseas.

The *Triton*, which has cost over half a million pounds and contains 1500 tons of steel, has been built for operations in water depths up to 120 feet and is fitted with four retractable legs, each of 200 ft in length and 8 ft in diameter. For reasons of stability, only an 80 ft length of each leg has been installed for the sea journey. The remaining lengths, together with 16 ft diameter footings designed to limit soil penetration, will be lashed to the deck during the tow. Construction, including the installation of the main drilling equipment, will be completed on arrival.

Living accommodation on board has not been provided for, as drilling crews will be ferried to and from shore bases.

The *Triton* is designed to withstand waves of 8 ft in height from trough to crest and a wind velocity of 75 mph under operating conditions.

The hydraulic cylinders for raising and lowering the legs are powered by pumps driven through 60 hp electric motors drawing current from four alternators each of 136 kW rating. Dimensions of the platform are: length 115 ft, width 80 ft, depth 15 ft.

Drilling Platform Commissioned in the Persian Gulf

The *Seashell*, the £1,800,000 mobile oil-drilling platform mentioned in the October 1959 issue of the *IP Review*, and built for Shell as a more versatile successor to the one wrecked in a sudden storm about three years ago off Qatar, was commissioned on 5 December 1959 in Doha Bay, Qatar.

His Highness Sheikh Ali bin Abdulla Al Thani, the Ruler of Qatar, A. J. Miller, a director of the Shell Company of Qatar Ltd, and M. W. Godfrey, general manager, attended the ceremony, during which His Highness cut a tape to start the drilling machinery after both the Qatari and Shell flags had been hoisted.

The trip from Holland took 75 days at an average speed of 3½ knots. Mostly the weather was good and the tugs could do four to five knots, but a head-on gale in the Red Sea cut the speed to one knot for a day or two, and even halted progress altogether for a while. Apart from this, the voyage was uneventful.

New Gulf International Bunkering Organization

A new international bunkering service has been established by Gulf Oil.

This new uniform marine organization comprises the Gulf Oil Corporation, Gulf Oil (Great Britain) Ltd, Gulf Oil (Belgium) SA, Danish American Gulf Oil Company A/S, Oy Gulf Oil AB, Gulf Oil (Nederland) NV, Svenska Gulf Oil Company AB, and their affiliates and supplying parties established throughout the Eastern and Western Hemispheres.

Mobil Railway Bridging Service to Midlands

Mobil Oil Company has introduced a new railway bridging service to Coventry from its Coryton terminal, which stands adjacent to the refinery. Block trains of twenty petroleum tank cars, running on a timetable schedule, each transport nearly 120,000 gallons of petroleum products.

After being filled at Coryton terminal, the wagons are shunted along Corringham light railway to the Thameshaven branch of the London-Tilbury-Southend line by the Company's own diesel engines, which also take back to the terminal empty wagons returned from Coventry.

The rail tank cars, built by the Powell Duffryn Engineering Company Ltd, the first of their kind to be used for motor spirit operations in the United Kingdom. Special Emco valves have been fitted to the bottom of each vehicle to replace the customary filling points on top of the cars, which permit loading and unloading to be controlled at ground level from either side of the vehicle.

In conjunction with the introduction of this service, Mobil is also building a railway embankment and enlarging the terminal at Coventry.

The embankment will carry two railway tracks with unloading columns situated in the centre. Alterations within the terminal include the trebling of the storage capacity, new loading bays for road tankers, and the installation of increased pumping capacity.

Turnkey Drilling Contract in Consortium Area

The Seacat Drilling Company of Iran SA has recently been awarded a contract with the Consortium Companies for the drilling of a wildcat well in a remote area of southern Iran, near Bandar Abbas, near the Gulf of Oman on the eastern extremity of the Consortium's concession area. By this type of contract the drilling contractor arranges to do all the work on a turnkey basis, that is, he is responsible, in addition to the drilling, for all the construction work, and for the marine and land transport of all materials required for drilling a 16,000-ft well.

The Seacat Drilling Company has taken the contract in conjunction with one of their associated companies, the Motherwell Bridge Contracting and Trading Company Ltd, who will be responsible to Seacat for the construction of a jetty, the off-loading of supplies, for a road to the location, and for the building of a warehouse, and also the construction of an all-weather landing strip suitable for Fokker Friendship aircraft.

The contractor is also responsible for the water supply and for the transport by sea and land from Bandar Mashur to the site. The contractor will unload the ship, which will have to lay off the coast some distance, and be responsible for getting all materials to site.

The rig which Seacat will supply is an Oilwell "96", driven by General Motors diesel engines and is complete with all accessories. A complete hutted camp is being provided and all transport units.

The contract was awarded on 16 September, and the materials arrived off Bandar Mashur at the end of December. It was hoped to spud the well towards the end of January 1960.

The oil company will be relieved of a major part of the responsibility for getting the work done, and this type of contract may set a pattern in the future for such wildcat locations, in areas remote from an oil company's centre of operations.

Milford Haven-Llandarcy Pipeline Complete

Britain's longest crude oil pipeline, which crosses 60 miles of complicated South Wales terrain to link Angle Bay, near Pembroke, with The British Petroleum Company's Llandarcy refinery, was completed early in December, right on schedule. This is part of the Company's £6,500,000 project to establish a deep-water supertanker terminal, capable of handling up to 120,000 tons of shipping at one time, on Milford Haven.

The 18-inch diameter pipeline will, when fully operational, have a throughput capacity of 5 million tons/year. It is, in fact, only the second major crude oil line in the United Kingdom—the first, from Finnart, on Scotland's west coast, to BP's Grangemouth refinery on the Firth of Forth, has been operated by the Company since 1951.

It has taken fourteen months to forge the link between the terminal, the construction of which is now well advanced, and the Llandarcy refinery. Thorough and extensive tests have been carried out by engineering experts, with the line being subjected to pressures of up to 1200 psi.

Highlight of the testing operations was the insertion into the line of a "go-devil". Thousands of gallons of water were used to force it through the pipe at a rate of approximately two miles/hour, cleaning the line which proved to be free of obstructions.

Twenty men were engaged on the tests, and six vehicles equipped with radio telephones were used to give on-the-spot information on the course of the operation to a control centre which was set up at the Kilpaison site headquarters. From the information received the pumping rate was varied, and hence the speed of the "go-devil" was controlled.

The 25-ft lengths of pipe were welded together, and before being buried to a depth of 2 ft 6 inches, were wrapped in glass fibre and bituminous enamel, with an additional layer of glass fibre on the outside.

Great care was taken over the reinstatement of land—to date 40 miles have been recultivated. Hedges and fences which barred the advance of the pipeline's 40-ft wide working strip were taken down and then replaced, fields reseeded, and roads restored. In a comparatively short space of time there will be little visual evidence of the task accomplished, for only in two sections is the pipe exposed—at Morriston where it crosses the main Swansea-Neath railway line, and inside the refinery fence.

Obstacles overcome on the laying of the line included a dozen major, and nearly a hundred minor, roads, twelve rail crossings, a canal, three underground aqueducts, and several main gas lines. Concrete culverts were placed under most of these obstructions.

Constructional hazards surrounded the crossing of four major and five minor rivers, and twenty-eight streams. Ten of the minor rivers and streams run in steep-sided ravines, and in one a shelf 700 yards long had to be excavated in the hillside to accommodate the pipe and working space alongside.

The crossing of the fast-flowing tidal river Towy alone was an engineering feat because at the site of the crossing it is 400 ft wide and 27 ft deep, and the eastern bank is bounded by main-line double railway tracks.

The pipe laid beneath the river was 430 ft long and with its concrete coating weighed 45 tons. First a trench to contain the pipe had to be dug to a depth of between 5–12 ft below the level of the river bed. This was eventually accomplished by using a dragline operating from a pontoon. At the same time, a 36-inch culvert was positioned beneath the railway tracks.

A great many difficulties presented themselves, including the river flooding and depositing the whole length of pipe some distance up a stream. Eventually the pipeline was towed across the river by pontoon, but high tides and the fast-flowing river partly refilled the underwater trench and the pipe would not sit down where it should. Ultimately, after the pipe had been "loaded" with water, 40 tons of concrete in oil drums attached to it, and the silt in the trench dispersed by a combination of compressed air and water jets, the crossing was accomplished.

Britain's Largest Tanker on Trials

An aerial view of BP Tanker Company's 50,000-*dw ton* British Queen *on her trials in the Clyde in mid-December*

Standardization Committee

By F. L. GARTON

(*Chairman of Standardization Committee*)

Historical Review

Some 3½ years after the formation of the Institution of Petroleum Technologists in 1913 a paper was delivered by E. Lawson Lomax on "The Testing and Standardization of Motor Fuel".* The author drew attention to divergencies, which were sometimes considerable, in the test procedures used by different laboratories for determining the same property. At this same meeting the president, Charles (later Lord) Greenway, read a letter from Alexander (later Sir Alexander) Duckham urging the need for uniformity of test methods and proposing that the Institution should appoint a Standardization Committee to investigate methods of testing and recommend standards for adoption in Britain.

Despite considerable support for this proposal, it was not until 1921 that the Standardization Committee was inaugurated under the chairmanship of Alexander Duckham, with five additional members. Twenty-three further members were co-opted, including representatives of the Admiralty, the War Office, the Air Ministry, the Government Laboratory, the National Physical Laboratory, and the Petroleum Department (Board of Trade). The terms of reference were those suggested by Mr Duckham, with the addition of nomenclature. Unlike ASTM Committee D-2 on Petroleum Products and Lubricants, Standardization Committee is not concerned with specifications for products, other than those used in testing.

There were six sub-committees as follows, with a total membership of 47 (places, not individuals), composed entirely of members of the main Committee:

(1) Naturally Occurring Bituminous Substances;

(2) Distillates up to Kerosine;

(3) Kerosine and Intermediates;

(4) Lubricants;

(5) Liquid Fuels;

(6) Asphaltum and Artificial Residues.

It is interesting that almost simultaneously the scope of Committee D-2 on Lubricants, of the American Society for Testing Materials, was enlarged to include other petroleum products.

The growing recognition of the importance of standardization was illustrated by the fact that Prof. J. S. S. Brame, in his 1922 presidential address, dealt with the international aspects of the subject.

The new Standardization Committee rapidly got down to work, and in October 1922 Dr A. E. Dunstan read a paper,† in which he summarized progress to that date.

Standard Methods of Testing Petroleum and Its Products first appeared in 1924. It was a slim, cloth-covered volume of 100 pages, containing 38 different methods, and sold at 6*s* a copy.

The second edition was published in 1929. This contained 137 pages of text, covering 50 different methods, and was about two-and-a-half times larger than the first edition. For the first time, advertisements were included and it sold for 7*s* 6*d* a copy. Specifications for thermometers and a sampling method, modified from the corresponding ASTM method, were included.

By the time the third edition was issued in 1935, the membership of Standardization Committee had increased to 95 and the Committee was concerning itself with such subjects as the knock rating of gasoline and oil measurement. The second world war caused some reduction in activities and the membership was only 12 in 1942 (fourth edition). Since the fifth edition (1944) publication has been annually, except for the years 1950 and 1954. The eighteenth edition (1959) contains 858 pages of text.

It is an interesting fact that, despite the general rise in prices, and the considerable fall in the value of money, *Standard Methods* now costs about 15 per cent less per page of text than in 1924!

In 1946 six overseas honorary members were elected to Standardization Committee and the number has since been increased to nine.

Organization

At the present time there are 33 members of Standardization Committee, including representatives of Government departments, the Services, British Standards Institution, and European standardizing bodies, but excluding ASTM representatives and honorary members. Of these 33 members, approximately one-third can be considered as representing consumer interests.

With a field of activity now covering about 130 methods, a considerable amount of work is involved in keeping *Standard Methods* up-to-date, and a large measure of decentralization is obviously necessary. For this reason there are a number of sub-committees with defined spheres of activity, the work being further sub-divided among panels responsible to appropriate sub-committees, as described below.

The membership of Standardization Committee and of its sub-committees and panels is published annually in *Standard Methods*. Taking all these groups together and omitting honorary and ASTM members, 338 different individuals occupy 727 places on these groups, some being members of more than one group.

The main Standardization Committee acts as a kind of steering committee for the work of its sub-committees and considers their recommendations from the policy angle. It also co-ordinates the activities of different sub-committees and concerns itself with co-operation with the BSI and with standardizing bodies in other countries. The relationship of the various sub-committees and panels is shown in the accompanying table.

Five of the ten sub-committees are organized to deal with test methods for specific types of products. The methods used for

J. Inst. Petrol. Technol., 1917, **4**, 6.
†*J. Inst. Petrol. Technol.*, 1922, **8**, 578.

engine tests on fuels and lubricants are of a rather specialized nature and for this reason there is a separate sub-committee (F) on engine tests. There are certain matters concerning all petroleum products which cannot conveniently be dealt with by a product sub-committee, and separate sub-committees deal with these matters. For example, methods for sampling and measurement may apply generally to a wide range of petroleum products, with perhaps modifications in some individual cases. Apparatus, such as thermometers or hydrometers, may be used in a number of different tests; there are obvious advantages in limiting, as far as possible, the number of different kinds of, say, thermometers, which laboratories must keep in stock.

It is a great advantage to users of *Standard Methods* if the different methods are presented in a similar arrangement and style; reference to individual points is thereby facilitated. All drafts of new or modified methods are therefore carefully considered from these viewpoints by the Editorial Sub-Committee (J) which is sometimes able also to offer valuable advice on technical points.

The application of modern methods of statistical analysis will often greatly assist in the development of new or improved test methods. For example, when a co-operative test programme is under consideration, such methods help to ensure that the maximum amount of information is obtained from the minimum number of tests. Again, when the test results are available, statistical analysis can show whether differences observed in parallel tests are significant or not and this has an obvious application in settling reliable limits of repeatability and reproducibility. The Statistical Sub-Committee (H) was formed in 1946 to assist other sub-committees and panels.

Many of the analytical methods are applicable to several different types of products. This is particularly true of some of the newer methods developed during the last few years. An Analysis Sub-Committee (G) was therefore formed in 1958 to take over the responsibility for the appropriate methods from existing product sub-committees.

The detailed work of standardizing new and modified test methods is handled by 47 panels. These panels are largely composed of experts on the tests concerned, who are able to arrange for any necessary laboratory work. Occasionally, for specific short term jobs, a panel may find it convenient to appoint a working group or sub-panel, which is wound up on completion of its assignment.

In order to provide good continuity from the organizational standpoint, each panel chairman is *ex-officio* a member of the controlling sub-committee, and each sub-committee chairman of the main Standardization Committee. The sub-committee membership is arranged to include people whose experience is not limited to the testing field.

Each member of Standardization Committee and its sub-committees and panels receives copies of the minutes of meetings of the group of which he is a member. In addition, sub-committee minutes are sent to all members of Standardization Committee and panel minutes to all members of the controlling sub-committee and to the chairman of Standardization Committee. This facilitates good control of activities.

Test Method Development

The main responsibility of Standardization Committee is the standardization of new methods of test as required and the improvement, where possible, of existing methods in accuracy, speed, and convenience; sometimes technical developments make some modification necessary. Many of the methods, such as viscosity, flash point, knock rating, etc., are required for testing products against manufacturing, marketing, and Government specifications, for which purpose a high degree of precision is usually required. During the last few years, however, the Committee has been concerned to an increasing extent with methods for hydrocarbon analysis, determination of additives, etc., used, for example, for control of manufacture, or buying specifications.

The need for a new test method or for the modification of an existing method may arise in various ways. Nowadays the demand for a new method usually derives from technical developments in industries or equipment using petroleum products, from control or investigational requirements within the oil industry, or from special needs of the Services. Modification of existing methods may arise in the same way, or from experimental work in petroleum laboratories indicating the possibility of improvement.

The first step would normally be discussion in the appropriate sub-committee or panel with a view to deciding whether it would be desirable to proceed with standardization. In due course Standardization Committee would be informed.

The next stage might be for experimental work to be done in one or more laboratories with the object of devising a possible method. When this point has been reached, co-operative tests would be carried out in a number of laboratories to ensure that the required accuracy and precision had been achieved; if not, then further experimental work would be necessary. The panel would consult the Statistical Sub-Committee for advice as to the best method of designing the co-operative tests, and again after the results had been obtained for interpretation of the latter and for setting reliable limits of precision. On the successful conclusion of this work, the method is written up by the panel, considered by the sub-committee, and finally by the Editorial Sub-Committee.

A standard layout has been agreed for IP Standard Methods, which are normally described under some or all of the following headings, as relevant.

Introduction
Scope
Definitions
Outline of method
Apparatus
Reagents and materials, or reference standards
Safety precautions
Preparation of sample
Preparation and standardization of apparatus
Procedure
Calculation and reporting
Precision.

National and International Aspects

The international nature of the oil industry obviously makes uniformity of testing methods throughout the world highly desirable. A good deal has been accomplished in this direction, but much still remains to be done. Unfortunately it is some of the more important specification-methods which give the greatest difficulty. Many of these methods were among the earliest to be developed and more or less different procedures were standardized in different countries at a time when international co-operation on such matters was much less close than it is to-day. Established practices, differences in apparatus and units of measurement, and perhaps to some extent national pride, tend to delay international agreement.

A certain amount of difficulty arises from the fact that there are differences between countries in the units of measurement

normally in use, or even specified by law, for example, as between metric, U.S.A., and Imperial units, degrees Centigrade and Fahrenheit. Wherever possible IP Standard Methods include both metric and Imperial units.

The national standardizing body in the U.K. is the British Standards Institution (BSI). During the last few years close co-operation has been established between the BSI and the Institute of Petroleum. Many IP members sit on various BSI committees, and oil industry representation on those BSI committees concerned with testing methods is arranged through IP Standardization Committee. BSI are represented on the latter. In this way BSI and IP have early advice of each others' plans, and a considerable number of IP methods have been adopted as British Standards.

Since many countries have adopted IP and ASTM methods, with or without modification, as their national standard methods for testing petroleum products, it was felt some years ago that co-operation between the two organizations was particularly important. Arrangements were made for certain members of IP Standardization Committee to be elected to ASTM Committees D-2 (Petroleum Products) and D-4 (Road and Paving Materials), and vice-versa; there is, therefore, an automatic exchange of minutes and information on activities. Chairmen of IP Standardization sub-committees and panels are also encouraged to correspond with their opposite numbers in ASTM with a view to keeping each other informed of plans and therefore securing co-operation at the earliest possible stage. It can be said that, so far as the standardization of new methods is concerned, the chances of agreement between ASTM and IP are good. The joint publication in 1952/53 of the ASTM/IP *Petroleum Measurement Tables* is an excellent example of international co-operation.

Considerable progress has also been made in bringing existing ASTM and IP methods into agreement. Since 1952 the number of methods of the two bodies, which are technically equivalent, has increased from 8 to 30. In several other cases the corresponding methods differ in the range of products covered, but are technically equivalent, within the area where the scope is the same.

The Bureau de Normalisation du Pétrole and the Hoofdcommissie voor de Normalisatie in Nederland are also represented on IP Standardization Committee.

For many years a correlation scheme for engine tests has been operated in the U.K. under the sponsorship of the panels of the IP Engine Tests Sub-Committee. Samples have been circulated periodically to co-operating laboratories, and the results analysed, in order to ensure that accurate results are obtained, and where possible to improve precision. In recent years several continental European organizations have expressed a desire to participate in these correlation schemes. This involves a certain amount of complication in the distribution of samples and provision of import licences, etc. For this reason the arrangements for the ordering, preparation, and distribution of samples have been changed to facilitate participation by organizations outside the U.K.

The international acceptance of methods of test for petroleum and petroleum products is handled by the International Organization for Standardization (ISO) through its Technical Committee No. 28 (Petroleum Products), formed in 1952. This Committee has held three meetings (June 1952, June 1955, and June 1959), at each of which IP Standardization Committee has been represented on the BSI delegation. There is strong IP Standardization Committee representation on Committee PTC/–/1, which handles ISO/TC-28 matters for BSI.

Agreement between different national bodies of this kind naturally tends to be slow, but with a spirit of give and take much could be accomplished. Standardization Committee is fully alive to the advantages of international standardization and is prepared to co-operate in any way with other organizations towards the achievement of this end.

In conclusion it should be mentioned that, whatever Standardization Committee has accomplished has been mainly due to the hard work put in by the sub-committee and panel members, and to the support of those organizations which have permitted co-operation by their staff and the use of their laboratory facilities.

Standardization Committee: Sub-Committees, Panels, and Sub-Panels

SUB-COMMITTEE A
MEASUREMENT AND SAMPLING

Panel	
ST–A–1	Tank Calibration
ST–A–2	Gauging
ST–A–3	Sampling
ST–A–4	Temperature
ST–A–5	Gravity
ST–A–6	Measurement, Calculations, and Tables
ST–A–7	Water and Sediment
ST–A–8	Postive Displacement Meters
ST–A–9	Volumetric Proving

SUB-COMMITTEE B
FUELS AND LIGHT DISTILLATES

Panel	
ST–B–1	Burning Tests
ST–B–2	Calorific Value
ST–B–3	Cloud Point of Dark Oils
ST–B–4	Colour
ST–B–5	Fuel Oil Flow
ST–B–6	Low Temperature Flow Characteristics, Aviation Turbine Fuel
ST–B–7	Stability of Fuel Oils
ST–B–8	Stability of Light Distillates
ST–B–9	Volatility
ST–B–10	General Tests

SUB-COMMITTEE C
LUBRICANTS AND WAX

Panel	
ST–C–1	General Tests Sub-Panel B—Full-Scale Axle Tests Sub-Panel C—IAE Gear Rig Tests
ST–C–2	Oxidation
ST–C–3	Rheology
ST–C–4	Miscellaneous Tests
ST–C–5	Cutting Oils
ST–C–6	Protectives
ST–C–7	Wax

SUB-COMMITTEE D
GREASE

Panel	
ST–D–1	General Tests
ST–D–2	Rheology
ST–D–3	Mechanical Tests
	Sub-Panel A—Grease Performance Test

SUB-COMMITTEE E
BITUMEN

Panel	
ST–E–1	Rheology
ST–E–2	Miscellaneous Tests
ST–E–3	Cutbacks
ST–E–4	Emulsions

SUB-COMMITTEE F
ENGINE TESTS

Panel	
ST–F–1	Engine Tests of Motor and Aviation Fuels
	Sub-Panel A—CFR Engine Operators
	Sub-Panel B—CFR Engine Experimental Studies
ST–F–2	Engine Tests of Diesel Fuels
	Sub-Panel A—
ST–F–3	Engine Tests of Lubricants
	Sub-Panel D—Engine Test Operators
	Sub-Panel F—Diesel Test Engine Standardization
	Sub-Panel G—Petter W.1.
	Sub-Panel H—IP/CLR

SUB-COMMITTEE G
ANALYSIS

Panel	
ST–G–1	Petroleum Gases
	Sub-Panel A—Gas Chromatography
ST–G–2	Hydrocarbon Analysis
ST–G–3	Inorganic Analysis
ST–G–4	Spectrometry
	Sub-Panel A—Emission Spectrometry
ST–G–5	Sulphur
	Sub-Panel A—Sulphur by X-Ray Absorption

SUB-COMMITTEE H
STATISTICAL

SUB-COMMITTEE I
APPARATUS

Panel	
ST–I–1	Specialized Equipment
ST–I–2	Thermometers and Hydrometers
ST–I–3	General Laboratory Equipment

SUB-COMMITTEE J
EDITORIAL

ST–J–1	Illustrations
ST–J–2	Revisions
ST–J–3	New Methods

U.K. Petroleum Equipment Orders

Orders for materials and equipment placed in the United Kingdom by oil companies during the third quarter of 1959 suffered a decline of £2,647,249 on the figure for the corresponding quarter of 1958.

The July–September quarter total was also a drop of nearly a million pounds on the previous quarter of 1959. There were increases in value, compared to the 1958 quarter, on the following categories. Geophysical and other exploratory equipment (156 per cent); specialized equipment for oil drilling and production; drums and can-making, filling and cleaning equipment, etc.; railcars, road tankers, aircraft refuellers, etc. (273 per cent); tankage, including tank fittings (198 per cent); boilers, boiler house plant and accessories (514 per cent); instruments, meters, and gauges; prime movers and compressors; automotive equipment; laboratory equipment and chemicals; and commissary and general requisites.

The remaining groups declined in value; specialized equipment for oil refineries; ferrous and non-ferrous plates, sections, sheets, and bars; and bulk chemicals suffering in particular with drops of 76, 83, and 30 per cent, respectively. Full details are given in the table.

	1959 *July–Sept.*	1958 *July–Sept.*
Geophysical and other exploratory equipment, etc.	102,587	40,130
Specialized equipment for oil drilling and production, including oil casing, tubing, etc.	2,136,901	1,510,147
Specialized equipment for oil refineries, etc. (not including pumps and valves)	606,355	2,068,172
Drums and can-making, filling and cleaning equipment, kerbside pumps, and other metering and dispensing equipment, etc.	863,685	358,214
Railcars, road tankers, aircraft refuellers, etc.	427,340	114,519
Drums, drumsheets, and tinplate ...	1,955,993	1,983,672
Tankage (including tank fittings) ...	1,141,450	382,449
Tubulars, pipe fittings, and valves (ferrous and non-ferrous)	3,095,912	3,773,203
Pumps (excluding slush, oilwell, and kerbside)	345,753	419,474
Boilers, boiler house plant and accessories, etc.	392,756	63,915
Electrical equipment—motors, generators, transformers, etc.	1,612,267	1,857,054
Instruments, meters, and gauges, etc. ...	515,027	469,118
Prime movers and compressors ...	1,298,338	938,423
Machine and hand tools, welding and miscellaneous machinery and stores	1,942,248	2,060,481
Ferrous and non-ferrous plates, sections, sheets, and bars	530,099	3,154,547
Automotive equipment, all types ...	2,254,515	1,454,536
Laboratory equipment and chemicals, including hospital and medical supplies	374,837	247,301
Bulk chemicals, catalysts, barytes, etc.	4,163,304	5,990,115
Cement and other building materials and hardware, including timber ...	554,579	773,356
Commissary, general requisites for office, warehouse, household, club and sports, etc.	2,195,556	1,497,925
	£26,509,502	£29,156,751

Oil Industry Corrosion Problems

A very successful symposium on Corrosion Problems of the Petroleum Industry was held in London on 26–27 November 1959. Organized by the Institute jointly with the Corrosion and the Chemical Engineering Groups of the Society of Chemical Industry. It was well attended and the discussions which followed the papers emphasized the importance of the subject matter. A total of nine papers covered oil industry operations, and included contributions on non-destructive testing and developments in corrosion-resistant materials.

Production Equipment

Dealing with oil production equipment and gathering lines, G. A. Lee and G. A. Haines (*Kuwait Oil Co. Ltd*) pointed out that for production equipment corrosion could be divided into two classes, (*a*) due to the fluid produced, and usually internal, or (*b*) due to environment in which it was used and thus external. Internal corrosion appeared to originate from hydrogen sulphide, carbon dioxide, and organic acids present in the fluid, this being referred to as sour if hydrogen sulphide is present, or otherwise sweet. Methods of combating both types were discussed.

The most common causes of external corrosion of well casings were (*a*) macro electrolytic cells in which flowline current is dissipated; (*b*) sulphate-reducing bacteria; and (*c*) local concentration cells. Methods of measuring casing currents were given and reference was made to preventive methods, including protective barriers, inhibitors, wellhead insulation, and cathodic protection. The use of the latter in Kuwait was outlined.

The most severe internal corrosion problem of surface equipment occurred in tankage, particularly with sour crudes. Preventive measures were referred to and the method of providing a tank with a concrete bottom.

Some reference to off-shore production facilities was made and the authors concluded by stressing that further research into the causes of corrosion could be undertaken profitably.

Marine Structures

Corrosion of steel structures used in oil production in Lake Maracaibo, Venezuela, was the basis of a paper by G. T. Colegate (*Compania Shell de Venezuela*), who discussed the methods taken to mitigate it. The water of the Lake presented the "world's worst corrosion problem". In the upper 20 feet of the lake the average rate of corrosion of steel was about 15 times as great as the generally-accepted average rate for sea water. At times, both in this region and near the lake bottom, instances were found where the rate was about 25 times that of sea water.

Mr Colegate discussed the characteristics of the Lake water, which were constantly changing, and outlined the types of steel structure used by his Company. The corrosion taking place on various parts of a bare steel structure was summarized and he then discussed the question of protection.

Tanker Corrosion

Corrosion of tanker hulls, and its prevention, was the subject of an interesting paper by J. G. Robinson and K. Fleming (*Shell Tankers Ltd*). While the emphasis was on tank interior corrosion, the corrosion of hulls and superstructures was considered.

The first part of the paper discussed the causes, nature, and occurrence of corrosion in relation to the tank space, the hull plating, rudders and stern areas, propellers, and superstructures.

Four methods of controlling corrosion were dealt with, (*a*) elimination of factors affecting corrosion; (*b*) inhibitors; (*c*) coatings; and (*d*) cathodic protection. One point made by the authors was that there is little prospect of solving the major problem of tanker corrosion by using other construction materials. The emphasis must be on reducing the corrosion of plain steel.

Storage Tanks and Pipelines

H. B. Footner (*Shell International Petroleum Co.*) and P. W. Heselgrave (*Spencer & Partners*) outlined recent development in protection of tanks and pipelines from corrosion. They dealt in particular with the external painting and the internal corrosion of tanks, of products pipelines and of terminal pipelines, and the corrosion of external surface of pipelines. In all instances the methods of corrosion prevention were discussed.

Refinery Equipment

The question of corrosion of refinery equipment was dealt with from two angles. The first paper in this section was on tubular heat exchangers, by P. T. Gilbert (*Yorkshire Imperial Metals Ltd*), and the second, by E. D. Dolan (*The British Petroleum Co. Ltd*), discussed salt-water cooling systems.

Summarizing methods of combating corrosion in tubular heat exchangers, Dr Gilbert said that the tendency in the past had been to rely on selection of materials. It had been shown that other aspects needed consideration and there was an increasing realization of the importance of design and operation. Whilst newer materials were being used to some extent, the well-established materials were capable of giving economic performance in most applications.

Amongst more recent developments he mentioned the use of copper-base alloys, duplex tubes and tube plates, control of corrosion on the product side by inhibitors, the use of cathodic protection on the water side, and the availability of protective coatings.

E. D. Dolan described methods used to protect major components of salt-water cooling systems. For successful protection the prerequisites were good hydraulic design and simple construction, with corrosion protection a major item in initial design. Developments with zinc alloy anodes plus linings of epoxy mastic were outlined, and results of other experiments were given. Various items of the installation were discussed and devices for corrosion control are listed in the paper.

In conclusion, Mr Dolan considered that effective corrosion-control measures of reasonable cost were now available for protection of all parts of the salt-water cooling system.

Non-Destructive Testing

In discussing the non-destructive testing of oil refinery plant, L. Wilkinson (*Esso Petroleum Co. Ltd*) outlined the methods available for (*a*) the measurement of loss of metal; (*b*) thickness measurements using gamma radiation; and (*c*) detection of flaws in material.

Dealing with future trends, the author concluded that,

although many of the old problems had been solved and were now routine, many more were being posed and their solution was a challenge to ingenuity.

Corrosion-Resistant Materials

The final subject for discussion was developments in corrosion-resistant materials, the metals being dealt with by G. L. Swales (*Mond Nickel Co. Ltd*), and the non-metals by H. I. Thomas (*Shell Refining Co. Ltd*) and T. S. McRoberts (*Shell Chemical Co. Ltd*).

The paper by Mr Swales referred in particular to developments in materials for specific applications in the production, transportation, and refining phases of the petroleum industry. Many of the important developments in this field do not necessarily involve better corrosion-resistance. Considerable importance also attaches to better mechanical properties and to improvement of fabrication and general adaptability of corrosion-resistant metals.

The use of such materials as surface coatings, linings, and non-metallic materials of construction were discussed by Thomas and McRoberts, specific reference being made to their anti-corrosive properties and protection of products. The types of material dealt with were (*a*) plastics; (*b*) rubbers; (*c*) carbon or graphite; (*d*) chemical stoneware and porcelain; and (*e*) glass and glass enamel.

The use of these materials was discussed in relation to pipes and to linings. In dealing with future prospects, the authors considered that much was now being done to provide information about new materials and more precise data concerning the older materials. More remained to be done and continued close co-operation between supplier and user would benefit both.

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U.K. Consumption of Petroleum Products

Deliveries of petroleum products (excluding bunkers) for inland consumption in the United Kingdom during the period January to September 1959 were 3,919,707 tons, or 17 per cent, more than those in the same period of 1958, according to figures published by the Petroleum Information Bureau on behalf of the U.K. Petroleum Industry Advisory Committee.

All products showed an increase in the 1959 period, apart from, once again, aviation fuel, vaporizing oil, and paraffin wax and scale. Particularly noteworthy increases were registered in the categories of propane and butane (43 per cent), "other products" (40 per cent), and fuel oil (34 per cent).

Full details are given in the table below.

U.K. Deliveries into Inland Consumption of Petroleum Products

Product	*January to September*			
	1958		1959	
	tons		*tons*	
Aviation fuels		1,249,356		1,218,934
Motor spirit (including motor benzole):				
Premier grades	2,916,015		3,353,835	
Standard grades	2,103,914		2,025,496	
		5,019,929		5,379,331
Industrial spirits (incl. industrial benzole)		135,422		149,817
White spirit		114,801		116,846
Kerosine:				
Burning oil	729,759		789,208	
Vaporizing oil	362,921		310,752	
		1,092,680		1,099,960
Derv fuel		1,515,744		1,672,403
Gas, diesel, and fuel oils:				
Gas/diesel oil	2,164,325		2,247,129	
Fuel oil	7,253,692		9,689,115	
Refinery consumption	1,802,893		2,261,318	
		11,220,910		14,197,562
Lubricating oils and greases		651,497		680,175
Paraffin wax and scale		39,126		37,592
Propane and butane		62,512		89,592
Bitumen		656,447		752,402
Other products		709,683		993,200
		22,468,107		26,387,814

New Year Honours

Appointments made by Her Majesty the Queen at the New Year include the following:—

K.B.E.

Rear-Admiral Sir Matthew Sausse Slattery, C.B., chairman and managing director, Short Brothers and Harland Ltd. Until recently, special adviser to the Prime Minister on the transport of Middle East oil.

H. E. Barry

C.B.E.

Steriker Norman Hare, lately general manager, Khanaqin Oil Company, Iraq.

O.B.E.

Harold Edward Barry, M.Inst. Pet., manager; Trade Relations Department, Head Office, Shell-Mex and B.P. Ltd.

Percy Hyde, engineer commodore, ss *British Robin*, BP Tanker Company Ltd.

M.B.E.

John Victor Jones, chief information officer, BP Refinery (Kent) Ltd.

John Kyriakou Theocharides, manager of the ocean bulk petroleum installation at Larnaca, Cyprus.

J. V. "Diver" Jones

B.E.M.

Arnold Edward Fitzgibbon, donkeyman, ss *Vitrinia*, Shell Tankers Ltd.

Henry George Jarvis, chief stillman, Carless, Capel and Leonard Ltd.

Charles Bernard McCartney, chief steward, ms *British Officer*, BP Tanker Company Ltd.

Charles George Watson, foreman engineer, Universal Oil Company Ltd and Alfred Smith Ltd.

Stamps and the Oil Industry

by **A. G. K. LEONARD**

"The postage stamps of a nation," declared the U.S. Postmaster General recently, "are a picture gallery of its glories. They depict in miniature its famous men and women, the great events of its history, its organizations, its industries, its natural wonders."

In line with this conception of the wider significance that can be accorded the "little bits of gummed paper" universally used to pre-pay correspondence—an approach now shared by the postal authorities of almost every country except Britain—the U.S. Postmaster General's department maintains a regular programme of special stamp issues, to the extent of about ten a year, commemorating important landmarks in American history and the contributions to the development of the United States made by different sections of the community.

In view of its key role in the national economy, it was fitting that the petroleum industry should receive philatelic recognition on the occasion of its centenary in the United States.

The commemorative stamp, in large upright format with an oil derrick outline as the central feature of its design, was printed in 120 million copies and placed on special "first-day-of-issue" sale with appropriate ceremonies at Titusville, Pa., exactly 100 years after "Colonel" Drake's historic oil strike there on 27 August 1859.

Drake's well, the forerunner of a vast industry, was never actually a great producer and was abandoned after a few years, but it was the first artesian oil well to be exploited in North America, although Canada claims priority of a year for that continent's "first commercially successful oilwell" —discovered and worked by James M. Williams in the "gum beds" of Oil Springs; the first genuine producing well there did not come in until 1862, however.

Canada is also keenly alive to the importance of postage stamp publicity and her Post Office Department stole a march on the United States by issuing its own "petroleum centenary" stamp on 10 September 1958, specifically to emphasize the important role played by Canadians in the development of petroleum.

In a strikingly effective design, printed in green and red, it typified a century of progress: a simple oil drop represented the early days when virtually the only derivative from crude oil was kerosine for lamps, while the many-faceted oil drop to its right symbolized the numerous derivatives now produced, by depicting the cracking tower, whose outline contrasted with that of the simple oil lamp opposite.

Oil derricks had previously been featured by both the United States and Canada on stamps commemorating the anniversaries of the foundation of California and Alberta, while the U.S. issue of 1951 honouring the diamond jubilee of the American Chemical Society had a symbolic design which included the towers of a catalytic cracking plant, a butadiene reactor, and a fractionating unit.

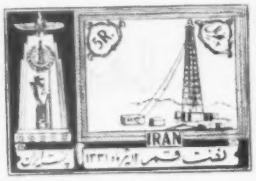
Egypt is another country whose postal authorities are fully aware of the publicity value of postage stamps and in recent years they have issued numerous attractive and colourful specimens marking various landmarks in Egyptian history, as well as lauding achievements of the Nasser regime.

In April 1959 there was a special issue commemorating the first Arab Petroleum Congress. In large vertical format, it had as its main feature a globe on which the Arab countries were prominent, with an oil derrick and section of pipeline around them. This was the second Egyptian stamp to feature the petroleum industry, for the previous July five stamps were produced to illustrate and proclaim Egypt's industrial aspirations, on the anniversary of the 1952 "Revolution." One of these was devoted to petroleum, exemplified by an oil plant and derrick.

The "Survey of Egypt" has taken great pains in its stamp printing and this issue struck a new note, for the stamps were printed in sheets of 25—five rows of five, each of which comprised five different designs, all in separate colours, meeting at the perforations, for current Egyptian stamp technique had dispensed entirely with the usual marginal frame.

Syria has just issued a special stamp, gay in three-colour printing, to commemorate the inauguration of a new oil refinery. 1959 also saw the appearance of the first distinctive stamps for Kuwait, which had previously used British stamps suitably over-printed. The new series offered some attractive pictorial subjects, including oil pipelines, waterside installations, and a view of the plant at Burgan.

Persia (Iran) has devoted no less than 15 stamps to petroleum themes. Eight issued in 1953 showed oilwells and a mosque; another five came out the same year to mark the second anniversary of the industry's nationalization, their designs including representations of a crude oil stabilizer, super fractionators, pipelines, and the Abadan refinery. The



50th anniversary of the Persian oil industry was commemorated in 1958 with two further stamps, brightly printed in four different colours, depicting a derrick and a hand holding a symbolic "bowl of flames."

France is another country prolific with her special stamps. Among the set issued in the summer of 1959 publicizing French technical achievements was a large multi-coloured specimen showing an oil derrick at Hassi Massaoud, with camels in the Sahara background, and a map of the pipeline to Bougie.

Austria, Bulgaria, Czechoslovakia, Yugoslavia, and Roumania are other European countries whose stamps have featured the petroleum industry in one form or another—derricks and refineries being the usual subjects—while West Germany in 1958 produced a special issue to honour the birth centenary of Rudolf Diesel: it showed the inventor and his first oil engine.

Roumania pointed the contrast between old and new when three stamps commemorated the centenary of that country's petroleum industry in 1957. Two showed modern refinery plant, with derricks in the background, and the other a horse-operated drill, illustrating the production methods of a century ago.

Russia has produced many stamps glorifying her industrial progress and Five- or Seven-Year Plans. Oil extraction had an issue of its own in 1948, while derricks and refineries have appeared on several other stamps.

When Rome was the venue of the Fourth World Petroleum Congress in 1955, the host country honoured the occasion with two special stamps. Both showed oil derricks, one against a background of ancient masonry, the other a line of them seeming to march majestically across the globe . . . both very effective designs.

Oil tankers, storage tanks, and refinery plants at Willem-

stad have been depicted on a Netherlands stamp, and the oil refinery at Aruba has appeared on an attractive three-colour triangular stamp issued by the Netherlands Antilles in 1955. The products of the Venezuelan oilwells treated there have been exemplified in the derricks and stylized refinery designs used for dozens of stamps from Venezuela, while the 6 cents stamps of Trinidad and Tobago, through three reigns from 1935 to date, have all depicted the historic discovery of Lake Asphalt by Sir Walter Raleigh in 1595.

Most of the Latin American oil-producing countries have issued stamps illustrating their national industries, among which petroleum is naturally prominent. They include Peru, Bolivia, and Guatemala as well as Argentina, Brazil, Colombia, and Mexico: the last four have also given the philatelist special issues commemorating landmarks in the history of their petroleum developments.

Argentina marked the 50th anniversary of her national oil industry in 1957 with a specimen showing a derrick and symbolic hands holding oil as wealth. Brazil, the following year, likewise marked the fifth anniversary of the establishment of the Petrobras corporation with a stamp whose design included a portrait of President Vargas, a drilling rig, and a clutching oily hand in the foreground. Colombia made a special issue in 1951 to celebrate the reversion to the government of the De Mares concession on the expiry of its lease to the Tropical Oil Co.

The expropriation of the principal foreign oil companies by the Mexican government was recalled in 1958, when four large bi-coloured stamps were brought out to mark the 20th anniversary of this event and to honour the role of Petroleos Mexicanos in developing that country's resources. The Pemex motto, "At the service of the nation", was featured on one of the stamps along with an oil storage tank; another showed a view of an oil refinery at night; while the top value presented a map of Mexico with its oil-producing areas shaded and shedding drops of oil on the silhouette of the ultra-modern Salamanca refinery. The set was completed by a design consisting of a derrick superimposed on an illustration of the ancient Aztec legend of an eagle slaying a snake, symbolizing the original settlement at what is now Mexico City.

Other countries which have given the "stamp of approval" to their petroleum industries include Azerbaijan, Italian Somaliland, Madagascar, and Réunion among French colonies, and Iraq and China. The list will doubtless receive additions as more and more postal authorities make postage stamps the messengers of publicity, but it seems unlikely that Great Britain will yet depart from her traditional sovereign's head designs. British stamps are indeed dignified, but many outside the philatelic ranks will share the regret that the GPO is so reluctant to use this convenient and profitable means of publicizing internationally some of Britain's major achievements in the fields of industrial and technical progress.

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M.O.A. APPROVED H.D. OILS

The following additional oils have been approved by the Director of Chemical Inspection, Ministry of Aviation, as complying with the requirements of Defence Specification DEF-2101.

Supplier and supplier's nomenclature	*OMD grade of oil*
Agip SpA	
Agip HD (SAE 30)	110
Agip HDS1 (SAE 30)	110
B.P. Trading Ltd	
BP 2112	40
Berry Wiggins & Co. Ltd	
Chevron Tuscan 30	110
Brown & Deighton Ltd	
Duchy Heavy Duty Engine Oil 150	40
J.O. Buchanan & Co. Ltd	
Etergo E.30	110
Davies & Co.	
Hydutol DEF 30 HD	110
Hydutol Special DEF 30 HD	110
Deutsche Erdol AG	
DEA 3103	110
DEA 3005	330
Esso Petroleum Co. Ltd	
——	110
Germ Lubricants Ltd	
Germil 312	110
Gulf Oil (Great Britain) Ltd	
Gulflube motor oil XHD20 20W(GBM)	60
Gulflube motor oil XHD 30(GBM)	110
Gulflube motor oil HD 30(GBM)	110
Henry Morris (1958) Ltd	
Morrivalve motor oil HD 30.S	110
Morrivalve motor oil HD 30.S	110
Henzell Oil Co. Ltd	
Henzella HD 10 W	40
Henzella HD 20 20 W	60
Henzella HD 30	110
Henzella HD 10W Supp. 1	40
Henzella HD 20/20W Supp. 1	60
Henzella HD 30 Supp. 1	110

Supplier and supplier's nomenclature	*OMD grade of oil*
Kenneth Thelwell Ltd	
Thelson diesel engine oil HD S 30	110
Manchester Oil Refinery Ltd	
Primor Mil 30 HD	110
Mobil Oil Co. Ltd	
——	110
——	110
——	110
Motrate Products Ltd	
Motrate dieselube Supreme HD Supplement	110
Motrate dieselube Supreme 50 HD	330
National Benzole Co. Ltd	
NBC DES 10W Supp. 1	40
NBC DES 20 20W Supp. 1	60
NBC DES 30 Supp. 1	110
National Iranian Oil Co.	
Iranol SAE 30	110
Oelwerke Julius Schindler GmbH	
Aristol HD SAE 30	110
Percy & Halden Ltd	
Luco DEF/OMD 110	110
Regent Oil Co. Ltd	
GB 2E/A	110
GB 5E	110
Service des Essences des Armees	
Huile No. 10-SEA-OMD	330
Shell International Petroleum Co. Ltd	
Shell Oil S.5608	110
Shell Oil S.5609	110
Shell Oil S.5559	110
Shell Petroleum Co. Ltd	
Shell Oil S. 5570	40
Shell Oil S. 5571	60
Shell Oil S. 5573	60
Shell Oil S. 5518	110
Sociedade Nacional de Petroleos	
TTE/HD SAE 30	110
C. C. Wakefield & Co. Ltd	
Wakefield H 13/59	330

The World's Ultimate Petroleum Reserves

Regarding the recent re-emergence of assertions in Parliament and sections of the Press in the U.K. that the world's supply of crude oil is "running out", and will only last for a few more years, it is interesting to note some recent remarks and statistics given by Lewis G. Weeks, president of the American Association of Petroleum Geologists.

Speaking at the Mid-Continent regional meeting of the AAPG, in Wichita, Kansas, Mr Weeks was discussing the subject of "Energy in 2059".

World population in 2059, he said, would be nearly three times the present level of 2500 million. This population growth, together with large increases in *per capita* demand, would produce a total energy demand in that year of between 40 and 50 times that of 1959. He estimated that demand would slightly more than double every 20 years.

To meet this accelerating demand the world held "far more hydrocarbons and other bitumens" than man would ever use. Within this context the ultimate oil supply of the world by conventional production methods was estimated by Mr Weeks to be 2,000,000 million barrels. Of this, the U.S.A.'s share would be 270,000 million.

These figures did not include gas liquids and no provision had been made for secondary recovery. From the latter source an estimate of about 1,500,000 million barrels of oil for the world, and some 190,000 million for the U.S.A., was given.

An ultimate world supply of 6000 million million cu ft of natural gas was predicted, 1000 million million being in the U.S.A.

Figures of 12,000,000 million barrels (2,000,000 million in the U.S.A.), and 7,000,000 million tons (U.S.A. 2,000,000 million), were given for ultimate reserves of shale oil and coal respectively. The average ton of coal was said to be equivalent to 8 barrels of oil.

The chief deterrent to the development of atomic energy and oil shale, the speaker said, would be capital costs.

Speaking about future oil reserves Mr Weeks said that although deeper drilling would find important reserves in many areas, there were "very sound geological reasons why the total amount will not be as great as is commonly assumed."

On the other hand, better techniques would greatly improve the economics of off-shore operations. Total shelf areas, in which prospects varied considerably, were about 3 million square miles—a total combined basin area equal to the entire area of the U.S.A.

The estimates of ultimate reserves of oil given by Mr Weeks are of particular interest as such figures are, for obvious reasons very rarely published.

The estimates of ultimate reserves that have probably been the most widely quoted in recent years are those contained in Wallace E. Pratt's analysis in the MacKinney Report to the U.S. Joint Congressional Committee on Atomic Energy, in February 1956.

These placed estimated ultimate free world recoverable reserves of crude oil and natural gas liquids at some 820,000 million brl. This was said to be composed of a proved reserve of 306,000 million brl at the end of 1954, and additional recoverable reserves were expected to be 514,000 million brl. The 1954 figure included reserves recoverable at costs then operative, and the estimate of additional resources were those recoverable at up to twice the then operating cost.

J. W. Platt (a director of the Royal Dutch/Shell Group), in April 1956, gave some further estimates in a like vein in a paper presented to the Institute, entitled "The Oil Industry —Its Place in the World and Its Future" (*J. Inst. Petrol.*, 1956, **42**, 217–27).

Mr Platt estimated that at that time proved reserves amounted to about 170,000 million brls—considerably less than Wallace Pratt's figure—and that future additions to free world recoverable reserves would be over 750,000 million brl. Total ultimate reserves, including those of the continental shelves, would be well over 1,000,000 million brl.

The latest estimates, by Mr Weeks, are therefore seen to be a great deal larger than previous authoritative pronouncements, although it would appear that the former cover the whole world and not merely the non-Soviet bloc countries. In addition, his figures for crude oil, unlike those of Wallace Pratt, do not include natural gas liquids, which are given separately above. With regard to the ultimate oil reserves of the U.S.A. alone, the AAPG president's forecast of 270,000 million is a spectacular upward assessment on the 120,000 million given by Mr Pratt.

It is equally interesting to compare the estimates of ultimate reserves of natural gas. The new figure of 6000 million million cu ft (1000 million million in the U.S.A.) compares strikingly with the total of about 3700 million million (725 million million in the U.S.A.) contained in Pratt's analysis, although it has been known for a few years past that natural gas reserves are increasing at a faster rate than those for crude oil.

Such spectacular increases in the most recent estimates of ultimate petroleum reserves are well in keeping with the trends of previous estimates. In 1945 total world oil reserves were said to be 485,000 million brl, and in 1954 the assessment rose to a figure of 600,000 million brl (both including the continental shelves). It is noteworthy that every time these authoritative estimates are made they are higher than before.

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Middle East Oil Production

	November	*Jan.–Nov.*
	Tons	
Iraq Petroleum Co. Ltd ...	2,452,357	24,754,921
Basrah Petroleum Co. Ltd ...	1,024,302	11,309,595
Mosul Petroleum Co. Ltd ...	103,481	1,161,072
Qatar Petroleum Co. Ltd ...	609,012	7,261,534
Iraanse Aardolie Exploratie en Productie Mij	3,934,000	40,846,000
Kuwait Oil Co. Ltd	5,565,399	62,981,902
	Barrels	
Arabian American Oil Co. ...	36,308,972	362,321,696
Bahrain Petroleum Co. Ltd...	1,355,934	15,078,295

The refinery throughput at Abadan of the Iraanse Aardolie Raffinage Mij for November was 1,347,000 tons, the total for 1 January to 30 November being 14,112,000 tons.

Crude processed at Aramco's Ras Tanura refinery during November was 5,878,939 brl, the total for 1 January to 30 November being 58,203,570 brl.

*World Petroleum Statistics 1958**

World production of crude petroleum was 6618 million brl in 1958, an increase of 3 per cent over the figure for 1957, according to statistics published by the U.S. Bureau of Mines. Most of this expansion was said to be in the U.S.S.R., where output rose by 16 per cent. In the free world, production failed to increase appreciably in 1958 for the first time since the second world war.

Crude petroleum exports from the U.S.A. and Venezuela, which had been abnormally high in 1957 to meet the Suez emergency, fell considerably. Conversely, with the resumption of the normal pattern of oil trade in the Middle East, crude oil shipments from that area rose by 22 per cent. Western Europe's imports likewise increased by 20 per cent in the year under review. Soviet exports doubled in quantity over the previous year.

In the refining sector, crude runs to stills amounted to 6539 million brl, and the output of major products in the free world to 5335 million brl. This compared with the figures of 6295 million and 5182 million respectively, for 1957.

After being adversely affected by the economic and political disturbances of 1957, the rise in free world demand was resumed in 1958 with an increase of 6 per cent, compared with a rise of only 2 per cent for the previous statistics. Domestic demand for major petroleum products was estimated as 5088 million brl in 1958. Consumption increased by 16 per cent in Western Europe, 22 per cent in South America, and 2 per cent in the U.S.A.

* *World Petroleum Statistics*—1958, prepared by J. V. Hightower, under the direction of Donald S. Colby, chief, Branch of Petroleum Economics, Division of Petroleum, USBM, WPS No. 128.

Definitions

Motor fuel—Includes aviation gasoline, other gasolines, and naphthas from crude petroleum and natural gasoline, and blended alcohol or benzol.

Kerosine—Includes all grades of kerosine for power, lighting, and heating.

Distillate fuel oil—Includes gas oil, diesel oil, and light heating oils.

Residual fuel oil—Includes blends of lubricating oil and oils used in grease manufacture. Also includes oils for use in electrical transformers.

Apparent domestic demand—The term "apparent" is used because, with few exceptions, no information on inventory change during the year was available. For the most part demand statistics were calculated by the following formula: imports plus domestic refinery production minus exports, the result then being adjusted for inventory change when available. Bunker loadings on aircraft and ships engaged in international trade are included in the domestic demand of the country where such loadings occurred. They are not classified as exports from that country.

TABLE I

WORLD SUPPLY AND DEMAND—CRUDE PETROLEUM—YEAR 1958

(Thousands of barrels)

Country	*Production*	*Imports*	*Exports*	*Crude runs to stills*	*Other demand and losses*	*Stock change*
NORTH AMERICA:						
Canada	165,519	105,859	31,679	241,225	(e) 2,400	−3,926
Cuba	344	25,756	—	25,987	5	108
Mexico	93,533	696	676	89,245	2,955	1,353
United States	2,448,837	348,007	4,329	2,776,094	35,504	−19,083
Total	2,708,233	480,318	36,684	3,132,551	40,864	−21,548
Daily average	7,420	1,316	101	8,583	112	−60
SOUTH AMERICA AND CARIBBEAN:						
Argentina	35,829	48,678	—	81,948	120	2,439
Bolivia	3,435	—	1,203	2,360	15	−143
Brazil	18,919	41,932	8,368	48,150	100	4,233
Chile	5,568	2,579	—	8,695	25	−573
Colombia	47,951	110	23,819	23,391	922	−71
Ecuador	3,108	—	722	2,434	15	−63
(a)Netherlands Antilles	—	247,731	—	244,112	—	3,619
Peru	18,732	—	2,166	16,105	60	401
Puerto Rico	—	23,728	—	23,790	—	−62
Trinidad	37,355	25,634	2,890	60,227	180	−308
Uruguay	—	8,090	—	8,222	—	−132
Venezuela	950,796	—	687,760	263,186	5,650	−5,800
Total	1,121,693	398,482	726,928	782,620	7,087	3,540
Daily average	3,073	1,092	1,992	2,144	19	10
WESTERN EUROPE:						
Austria	19,546	—	6,929	12,871	60	−314
Belgium	—	47,999	—	48,835	—	−836
Denmark	—	201	—	206	—	−5
Finland	—	(E) 6,360	—	(E) 6,300	—	60
France	9,986	208,928	329	218,456	50	79
Germany, Western	32,126	78,654	—	109,983	100	697
Greece	—	1,701	—	879	—	822
Italy and Trieste	10,461	166,053	1,538	176,897	50	−1,971
Netherlands	11,306	102,051	—	112,397	50	910
Norway	—	580	—	594	—	−14
Portugal	—	8,537	—	8,741	—	−204
Spain	—	28,802	—	29,410	—	−608

TABLE I—*(continued)*
WORLD SUPPLY AND DEMAND—CRUDE PETROLEUM—YEAR 1958
(Thousands of barrels)

Country	*Production*	*Imports*	*Exports*	*Crude runs to stills*	*Other demand and losses*	*Stock change*
Sweden	—	16,086	—	15,800	—	286
United Kingdom	584	238,555	—	239,437	5	−303
Yugoslavia	3,267	4,638	—	8,060	20	−175
Total	87,276	909,145	8,796	988,866	335	−1,576
Daily average	239	2,491	24	2,709	1	−4
MIDDLE EAST:						
Aden	—	27,546	—	27,810	—	−264
Bahrain	14,873	55,375	—	70,229	152	−133
Egypt	22,109	(*e*) 10,300	7,608	(*E*) 23,000	100	1,701
Iran	301,361	—	178,585	(*e*) 119,400	1,000	2,376
Iraq	266,125	—	251,288	13,506	600	731
Israel	642	(*E*) 9,000	—	9,042	5	595
Kuwait	509,654	—	465,393	43,758	55	448
Lebanon	—	5,863	—	5,863	—	—
Neutral Zone	29,469	—	25,250	(*E*) 4,100	195	−76
Qatar	63,412	—	(*e*) 63,152	(*E*) 160	100	—
Saudi Arabia	370,486	—	307,182	61,363	1,207	734
Turkey	2,379	—	—	2,171	15	193
Total	1,580,510	108,084	1,298,458	380,402	3,429	6,305
Daily average	4,330	296	3,558	1,042	9	17
OTHER ASIA:						
China	(*E*) 6,000	(*E*) —	—	(*E*) 6,000	—	—
Formosa	15	5,655	—	5,465	—	205
Burma	3,454	—	—			
India	3,448	34,300	—	42,628	60	786
Pakistan	2,272	—	—			
Japan	2,563	103,877	—	104,944	10	1,486
Total	17,752	143,832	—	159,037	70	2,477
Daily average	49	394	—	436	—	7
OTHER AFRICA:						
Algeria	3,420	—	2,953	—	15	452
Canary Islands	—	20,361	—	20,374	—	−13
Morocco	560	403	—	1,128	2	−167
Union of South Africa	—	9,187	—	8,884	—	303
Angola	358	—	—	394	—	−36
French Equator. Africa	3,550	—	3,277	—	10	263
Nigeria	1,970	—	1,885	—	20	65
Total	9,858	29,951	8,115	30,780	47	867
Daily average	27	82	22	84	—	3
OCEANIA:						
Australia	—	71,829	—	72,339	—	−510
British Borneo	39,551	—	23,563	94,365	650	941
Indonesia	118,715	15,848	54,595			
Philippines	—	9,121	—	8,764	—	357
New Guinea	1,850	—	(*E*) 1,840	—	10	—
New Zealand	5	—	—	—	5	—
Total	160,121	96,798	79,998	175,468	665	788
Daily average	439	265	219	481	2	2
TOTAL ABOVE COUNTRIES	5,685,443	2,166,610	2,158,979	5,649,724	52,497	−9,147
Daily average	15,578	5,937	5,916	15,480	144	−25
U.S.S.R. AND EASTERN EUROPE:						
U.S.S.R.	834,225	—	66,025	(*E*) 764,200	4,000	—
Other Eastern Europe	97,957	27,243	—	(*E*) 124,700	500	—
Total	932,182	27,243	66,025	888,900	4,500	—
Daily average	2,554	75	181	2,436	12	—
WORLD TOTAL	6,617,625	2,193,853	2,225,004	6,538,624	56,997	−9,147
Daily average	18,133	6,011	6,097	17,916	156	−25

(*a*) Netherlands Antilles imports are net, excluding 3,550,000 barrels re-exported.
(*e*) Partly estimated. (*E*) Estimated.

TABLE II

PRODUCTION OF MAJOR REFINED PRODUCTS*—YEAR 1958

(Thousands of barrels)

Country	Motor fuel**	Kerosine	Distillate fuel oil	Residual fuel oil	Lubricating oil	Total major products
NORTH AMERICA (Total)	1,619,565	133,623	707,886	462,561	54,186	2,977,821
Canada	93,389	12,620	61,690	41,855	1,979	211,533
Cuba	5,735	1,030	4,840	12,735	—	24,340
Mexico	23,930	9,965	9,951	44,613	909	89,368
United States	1,496,511	110,008	631,405	363,358	51,298	2,652,580
SOUTH AMERICA AND CARIBBEAN (Total)	183,332	37,642	143,096	394,643	4,525	763,238
Argentina	16,557	8,628	13,113	35,961	1,176	75,435
Bolivia	922	346	268	729	—	2,265
Brazil	18,742	1,937	6,098	18,646	—	45,423
Chile	3,724	418	1,548	2,300	—	7,990
Colombia	7,904	1,551	2,755	9,530	82	21,822
Ecuador	734	239	446	866	—	2,285
Netherlands Antilles	61,706	9,688	47,813	138,287	1,885	259,379
Peru	5,884	3,083	4,967	2,566	86	16,586
Puerto Rico	9,215	842	2,355	10,519	—	22,931
Trinidad	13,517	3,123	12,749	26,014	—	55,403
Uruguay	2,126	1,256	971	3,677	—	8,030
Venezuela	42,301	6,531	50,013	145,548	1,296	245,689
WESTERN EUROPE (Total)	238,736	33,720	234,777	388,474	16,369	912,076
Austria	1,910	963	3,692	6,373	407	13,345
Belgium	11,676	1,792	13,100	17,566	199	44,333
Denmark	—	—	45	8	—	53
Finland	(E) 2,550	(E) 190	(E) 1,500	(E) 1,300	—	5,540
France	54,992	3,319	48,791	79,244	3,977	190,323
Germany, Western	34,175	341	28,288	28,971	2,779	94,554
Greece	—	57	214	261	—	532
Italy and Trieste	33,965	3,701	45,372	73,333	1,078	157,449
Netherlands	27,937	6,115	33,002	54,310	1,758	123,122
Norway	97	—	142	26	135	400
Portugal	2,437	1,850	1,266	2,839	—	8,392
Spain	5,784	1,817	5,937	13,581	266	27,385
Sweden	2,082	2,690	3,491	7,259	126	15,648
United Kingdom	58,929	10,407	47,714	100,800	5,344	223,194
Yugoslavia	2,202	478	2,223	2,603	300	7,806
MIDDLE EAST (Total)	65,573	39,956	77,138	173,071	121	355,859
Aden	4,603	2,446	5,708	13,319	—	26,076
Bahrain	17,249	5,307	15,257	27,862	—	65,675
Egypt	(E) 2,600	(E) 2,700	(E) 2,800	(E) 13,300	—	21,400
Iran	(e) 23,600	(e) 18,800	(e) 20,200	(e) 50,600	121	113,321
Iraq	2,117	2,108	2,606	5,162	—	11,993
Israel	1,571	1,398	1,894	3,390	—	8,253
Kuwait	621	2,286	12,508	26,979	—	42,394
Lebanon	999	599	1,269	2,693	—	5,560
Neutral Zone	(E) —	(E) —	(E) —	(e) 3,100	—	3,100
Qatar	(E) 60	(E) 20	(E) 60	(E) 10	—	150
Saudi Arabia	11,600	4,292	14,664	25,564	—	56,120
Turkey	553	—	172	1,092	—	1,817
OTHER ASIA (Total)	40,225	15,569	25,675	59,495	3,233	144,197
China	(E) 2,200	(E) 600	(E) 400	(E) 1,800	(E) 300	5,300
Formosa	1,267	1,002	987	1,818	—	5,074
Burma, India, Pakistan	10,557	5,769	10,010	12,345	44	38,725
Japan	26,201	8,198	14,278	43,532	2,889	95,098
OTHER AFRICA (Total)	6,247	1,374	7,020	11,912	92	26,645
Angola	73	8	74	231	—	386
Canary Islands	2,714	852	4,279	9,370	92	17,307
Morocco	389	92	238	198	—	917
Union of South Africa	3,071	422	2,429	2,113	—	8,035

TABLE II—(*continued*)
PRODUCTION OF MAJOR REFINED PRODUCTS*—YEAR 1958
(Thousands of barrels)

Country	*Motor fuel***	*Kerosine*	*Distillate fuel oil*	*Residual fuel oil*	*Lubricating oil*	*Total major products*
OCEANIA (Total)	52,597	13,464	38,793	50,558	218	155,630
Australia...	29,540	867	15,845	20,217	218	66,687
British Borneo	19,695	12,021	21,238	27,463	—	80,417
Indonesia						
Philippines	3,362	576	1,710	2,878	—	8,526
TOTAL ABOVE COUNTRIES ...	2,206,275	275,348	1,234,385	1,540,714	78,744	5,335,466
Daily average	6,045	754	3,382	4,222	216	14,619

(*e*) Partly estimated. (*E*) Estimated. *From crude petroleum, blending agents and oils re-processed. **Motor fuel includes the following known amounts of jet fuel (1,000 barrels) for these countries: Canada, 4,279; United States, 73,676; Venezuela, 4,090; Colombia, 20; Netherlands Antilles, 19,404; Peru, 58; Trinidad, 1,300; Spain, 1,832; France, 3,349; Germany, 1,186; Italy, 5,728; Bahrain, 4,290; Saudi Arabia, 4,184; Australia, 991.

TABLE III
APPARENT DOMESTIC DEMAND*, REFINED PRODUCTS, 1958
(Thousands of barrels)

Country	*Gasoline*	*Kerosine*	*Distillate fuel oil*	*Residual fuel oil*	*Lubricants*	*Total*
NORTH AMERICA AND CARIBBEAN:						
(*a*) Canada	97,210	15,903	74,208	51,062	3,309	241,692
Costa Rica	524	43	510	185	22	1,284
(*a*) Cuba	6,271	1,039	3,027	11,682	226	22,245
Dominican Republic	850	100	400	1,000	60	2,410
El Salvador	788	245	199	414	29	1,675
Guatemala	1,039	176	538	1,056	53	2,862
Haiti	320	15	205	154	8	702
Honduras, British	47	15	25	—	6	93
Jamaica	735	225	854	2,643	39	4,496
(*a*) Mexico	27,477	10,474	11,495	34,888	1,026	85,360
Nicaragua	477	49	353	206	28	1,113
Panama, Canal Zone	197	35	2,233	2,929	10	5,404
Panama, Republic	967	214	394	777	28	2,380
Puerto Rico	4,324	770	695	5,284	78	11,151
Trinidad	2,282	267	4,358	8,672	46	15,625
(*a*) United States	1,417,975	113,330	652,455	531,116	39,439	2,754,315
(*a*) Alaska and Hawaii	5,840	92	3,285	5,835	140	15,192
Subtotal	1,567,323	142,992	755,234	657,903	44,547	3,167,999
SOUTH AMERICA:						
(*a*) Argentina	17,104	9,999	16,633	42,046	1,404	87,186
(*a*) Bolivia	905	248	265	611	35	2,064
(*a*) Brazil	28,432	4,487	14,919	28,978	1,431	78,247
Chile	4,355	1,290	2,760	5,292	267	13,964
(*a*) Colombia	8,248	1,569	2,691	4,355	231	17,094
Ecuador	1,260	240	551	965	50	3,066
(*b*) Netherlands Antilles	13,953	78	9,364	33,878	17	57,290
(*a*) Paraguay	288	81	92	116	10	587
(*a*) Peru	5,780	2,195	3,629	3,393	193	15,190
Uruguay	2,527	1,256	1,368	4,184	36	9,371
(*a*) Venezuela	13,543	3,302	8,201	20,990	471	46,507
Subtotal	96,395	24,745	60,473	144,808	4,145	330,566
WESTERN EUROPE:						
(*a*) Austria	3,757	121	2,984	7,013	577	14,452
Belgium and Luxembourg	11,152	695	13,543	18,886	789	45,065
Denmark	7,063	1,019	9,280	14,170	385	31,917
Finland	3,500	500	4,000	2,000	150	10,150
(*a*) France...	43,707	746	36,544	61,205	3,374	145,576
(*a*) Germany, Western	36,928	415	34,078	60,519	3,927	135,867
Greece...	2,397	977	4,231	5,426	130	13,161
Iceland	540	40	777	990	33	2,380
(*a*) Ireland	3,073	796	1,512	2,145	141	7,667
Italy	16,076	1,227	18,472	65,058	1,451	102,284
Netherlands	9,282	3,239	15,823	27,886	1,300	57,530
Norway	3,467	1,288	8,258	9,406	345	22,764

TABLE III—(*continued*)

APPARENT DOMESTIC DEMAND*, REFINED PRODUCTS, 1958

(Thousands of barrels)

Country	*Gasoline*	*Kerosine*	*Distillate fuel oil*	*Residual fuel oil*	*Lubricants*	*Total*
Portugal	1,437	1,950	3,199	3,523	158	10,267
Spain	5,460	1,890	6,058	14,607	799	28,814
(*a*) Sweden	11,747	1,783	27,236	28,026	784	69,576
Switzerland	6,800	533	11,638	3,810	328	23,109
(*a*) United Kingdom	73,630	12,348	45,161	111,123	6,191	248,453
Yugoslavia	2,100	473	2,148	2,423	397	7,541
Subtotal	242,116	30,040	244,942	438,216	21,259	976,573
MIDDLE EAST:						
Aden	355	76	7,205	16,778	16	24,430
Bahrain	314	157	2,017	4,063	7	6,558
Iran	3,280	4,710	4,428	15,760	85	28,263
Iraq	2,117	2,108	2,606	5,162	100	12,093
Israel	1,606	1,209	1,976	5,608	80	10,479
Jordan	420	293	475	50	20	1,258
(*a*) Kuwait	916	197	1,703	16,372	30	19,218
Lebanon	1,098	350	1,015	2,000	40	4,503
Neutral Zone	10	5	20	320	2	357
Saudi Arabia	1,500	425	1,740	10,286	70	14,021
Turkey	4,972	1,828	5,600	1,407	450	14,257
U.A.R., Syria	612	488	2,529	1,359	90	5,078
Subtotal	17,200	11,846	31,314	79,165	990	140,515
ASIA:						
Burma	1,214	564	663	399	75	2,915
Cambodia and South Vietnam	2,313	620	907	740	94	4,674
Ceylon	1,311	967	1,398	3,000	52	6,728
India	8,519	12,861	10,617	9,904	1,500	43,401
Japan	25,837	8,430	21,898	58,341	3,550	118,056
(*a*) Korea, South	1,493	319	859	2,206	65	4,942
Malaya and Singapore	2,701	1,106	6,793	15,487	175	26,262
(*a*) Pakistan	2,137	1,659	3,905	6,405	269	14,375
Taiwan	1,292	1,002	987	1,818	64	5,163
Thailand	2,325	689	2,263	1,000	159	6,436
Subtotal	49,142	28,217	50,290	99,300	6,003	232,952
AFRICA:						
(*a*) Algeria	2,673	665	2,304	2,009	150	7,801
(*a*) Angola	385	72	458	360	41	1,316
Belgian Congo	1,850	306	1,171	251	110	3,688
Canary Islands	1,536	439	1,714	2,777	100	6,566
Ethiopia	661	32	113	—	37	843
States formerly in French Equatorial Africa	1,006	226	391	214	75	1,912
French West Africa	1,812	425	3,055	5,143	99	10,534
Ghana	1,250	320	756	470	63	2,859
Kenya	1,025	274	812	3,178	63	5,352
Liberia	161	35	176	40	12	424
Madagascar	502	132	260	20	40	954
Morocco	2,200	400	1,050	1,285	50	4,985
Nigeria	2,176	713	1,160	252	98	4,399
Rhodesia and Nyasaland	2,177	302	900	205	147	3,731
Sudan	924	278	710	1,196	77	3,185
(*a*) Tanganyika	544	191	541	493	42	1,811
(*a*) Tunisia	680	300	742	1,159	52	2,933
(*a*) Uganda	556	146	242	90	32	1,066
(*a*) Union of South Africa	13,555	3,931	5,563	2,495	900	26,444
U.A.R., Egypt	2,904	4,100	4,343	15,700	382	27,429
Subtotal	38,577	13,287	26,461	37,337	2,570	118,232
OCEANIA:						
(*a*) Australia	32,060	3,490	11,271	17,395	1,377	65,593
British Borneo	1,479	780	1,710	106	19	4,094
(*a*) Indonesia	6,091	8,146	4,534	4,958	359	24,088
New Caledonia	124	27	172	57	11	391
New Zealand	7,262	299	2,423	2,320	263	12,567
Philippines	5,930	1,483	3,369	3,883	135	14,800

TABLE III—*(continued)*

APPARENT DOMESTIC DEMAND, REFINED PRODUCTS, 1958

(Thousands of barrels)

Country	*Gasoline*	*Kerosine*	*Distillate fuel oil*	*Residual fuel oil*	*Lubricants*	*Total*
Subtotal	52,946	14,225	23,479	28,719	2,164	121,533
(c) WORLD TOTAL EXCLUDING EASTERN EUROPE, U.S.S.R. AND MAINLAND CHINA	2,063,699	265,352	1,192,193	1,485,448	81,678	5,088,370

*Unless otherwise specified, data represent apparent domestic demand (including inland demand, refinery fuel and loss, and bunkers). Apparent domestic demand is derived from the components of refined product output, plus imports, minus exports, with no allowance for changes in stocks.

(*a*) Domestic demand as reported, including stock changes.

(*b*) Apparent domestic demand for Netherlands Antilles is heavily influenced by refinery fuel and losses, bunker loadings (including aviation bunkers), and stock changes.

(*c*) Above figures exclude demand for jet fuel in following countries (in 1,000 barrels)—North America: Canada, 4,058; United States, 94,576. South America: Colombia, 17; Netherlands Antilles, 836; Venezuela, 92. Western Europe: France, 852; Germany, 102; Greece, 47; Italy, 1,780; Spain, 183. Middle East: Aden, 100; Saudi Arabia, 355. Asia: India, 700; Japan, 580; Pakistan, 331. Africa: (Not available). Oceania: Australia, 966; Indonesia, 37. For all other countries demand for jet fuel, if any, was not reported separately.

TABLE IV

BUNKER OIL DELIVERIES TO VESSELS ENGAGED IN INTERNATIONAL TRADE, 1958

(Thousands of barrels daily)

Zone	JANUARY—JUNE			JULY—DECEMBER		
	Bunker distillate	*Bunker residual*	*Total*	*Bunker distillate*	*Bunker residual*	*Total*
United States (continental)	31·3	196·3	227·6	34·2	183·9	218·1
Canada*	2·7	14·3	17·0	6·0	18·7	24·7
Central and South America	14·9	56·1	71·0	14·5	63·5	78·0
West Indies	32·5	85·7	118·2	29·9	82·8	112·7
West Africa*	33·5	39·4	72·9	34·3	37·2	71·5
United Kingdom and Ireland	19·8	57·2	77·0	18·5	64·0	82·5
North Europe, including French and Atlantic Ports	33·0	61·7	94·7	29·8	60·2	90·0
Mediterranean, including Spain and Portugal ...	25·2	47·1	72·3	25·9	56·2	82·1
Middle East, including Red Sea, Egypt, and Persian Gulf	30·3	129·5	159·8	28·5	135·0	163·5
South and East Africa	3·9	12·3	16·2	3·7	11·8	15·5
India, Burma, and Ceylon	1·6	14·4	16·0	1·6	15·6	17·2
East and South Asia, including Indonesia and Japan	15·6	60·4	76·0	16·7	60·6	77·3
Australasia	6·4	17·5	23·9	5·5	17·2	22·7
Total above	250·7	791·9	1,042·6	249·1	806·7	1,055·8

* Partly estimated.

★ ★ ★

FUEL, POWER, AND NATIONAL PROSPERITY

A series of three Cantor Lectures on "The Fuel and Power Industries and National Prosperity" is to be delivered to the Royal Society of Arts by Dr A. Parker, C.B.E., lately director of Fuel Research, D.S.I.R. The lectures are at 6.0 p.m. on Mondays, 15, 22, and 29 February. Dr Parker, in his first lecture, will deal with the use of energy and its effect on productivity, national income and living standards, on past and future trends in fuel and power use, and on efficient prices and national expenditure on fuel and power. His second lecture will be devoted to the production and treatment of coals and oils, and his third lecture will be concerned with natural and manufactured gas, including the treatment and distribution of natural gas, the production of coke, gas, and oils from solid fuels, and the production of chemicals from the oils.

Tickets for the Cantor lectures are available from the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2.

Books and Films

Shell's Petroleum Handbook

The last edition of Shell Petroleum's classic mine of oil information, *The Petroleum Handbook*, was produced in 1948. In the intervening years the petroleum industry has undergone many changes—in policies, structure, the variety of its products, and in the processes used to produce them. It was felt, therefore, that a new up-to-date edition of the *Handbook* was required, and the fruit of what was obviously an immense amount of labour is now available in the shape of the Fourth Edition.

All sections have been completely re-written, but the overall length of the book remains much the same as its predecessors, for although a great deal of fresh space has been devoted to the new petroleum chemical industry, and research and developments in other fields, excessive data on other subjects have been eliminated.

A more comprehensive index has been included and, with technical terms explained where they first appear in the text, a glossary is rendered unnecessary, and this maintains a continuity for the reader.

Particular attention has also been paid in the new edition to clarity and layout, which with the increased page size of the publication and the excellent simplified drawings, go to make a presentation which is a considerable advance on its predecessors.

As in earlier editions, the authors are all members of the Royal Dutch Shell Group, and the diagrammatic illustrations were also prepared by Shell staff. The editor of *The Petroleum Handbook*, who remains anonymous throughout, is to be sincerely congratulated on the production of what is an indispensable manual of the petroleum industry, enabling both the specialist to gain information on other fields of the industry, and the layman with technical interests to gain an excellent grounding in petroleum technology.

For the first time in the editions of *The Petroleum Handbook* copies are available to people outside the Royal Dutch Shell Group, and are obtainable at 21*s* a copy—a most reasonable price—from Shell International Petroleum Co. Ltd, No. 1 Kingsway, London, W.C.2.

Prices and Taxes on Petroleum Products

The latest quarterly inventory of *World Retail Prices and Taxes on Gasoline, Kerosine, and Motor Lubricating Oils*, produced by the U.S. Bureau of Mines in Washington, has now been published.

The statistical tables list the prices in representative cities in various countries of the world during or about the period July–September 1959. All values are expressed in cents per U.S. gallon.

Countries featured in this latest booklet are Argentina, the Benelux countries, Fiji Islands, France, French W. Indies, Italy, Japan, Jordan, Peru, Spain, U.K., and the U.S.A.

Fawley Foundation Lecture

The Sixth Fawley Foundation Lecture, 1959, has now been published by the University of Southampton. Entitled "The Risks of Progress", the Lecture was presented by The Rt Hon the Lord Adrian, O.M., D.Sc., M.D., LL.D., F.R.S., on 17 November 1959.

The progress of technology is traced, together with its influence on society. It is pointed out that although so far as highly industrialized countries were concerned, the need for physical exertion in work had almost gone, there were still many parts of the world to be freed from poverty and hard labour. Technology and industry still could advance in this sphere.

The need for keeping population growth, the provision of food and housing, and the planned use of energy supplies, abreast of each other was discussed, as were the new problems which will arise in using intelligently the increased leisure time which could be one of the major benefits of technological advances.

In conclusion the frightful dangers that uncontrolled applications of science might bring, such as the risks which are run by exposure to radiation from natural sources—cosmic rays and radioactive materials—and also of nuclear war, are pointed out, both for present and future generations. Genetic deterioration from many sources was a particularly important problem for the future.

"The Risks of Progress", price 2*s* 6*d*, is obtainable from the University of Southampton.

British Welding Research Association

A new handbook has been published by the British Welding Research Association on *The Design of Welded Pipe Fittings*, under the authorship of P. H. R. Lane, B.Sc. (Eng.), A.I.M., and R.T. Rose, B.Sc., Ph.D. In addition to summarizing the work on piping components and detailing various extensive stress measurements, the book highlights the feeling of the Association that a new approach to welding application is necessary. A better understanding of the stress systems arising in the equipment to be designed is required, together with entirely new constructive thought on the application of the various welding processes and on the research that should be applied to all stages of the subject.

To this end the BWRA has inaugurated a Design Advisory Service to show its members how such research work can be applied to achieve economic results.

In addition, the BWRA are organizing a symposium, in conjunction with the Engineering Department of Cambridge University, from 29 March–1 April 1960, under the title of Symposium on Fatigue of Welded Structures.

The fee for membership of the Symposium, which is to be held at the University, is 15 guineas. Further particulars may be obtained from the British Welding Research Association, Abington Hall, Abington, Cambs.

"British Chemicals and Their Manufacturers"

The 1959 edition of *British Chemicals and Their Manufacturers*, just published by the Association of British Chemical Manufacturers, is an extension of previous publications in the series and contains over 12,000 chemical products and the names of the manufacturers of those products. This is said to be unique within the chemical field.

In addition the book contains a classified list of indicators and microscopical stains, and lists of proprietary and trade marks and names. Copies of the booklet are obtainable free of charge by persons or firms genuinely interested in the manufacture or purchase of chemicals. Enquiries should be addressed to the ABCM at Cecil Chambers, 86 Strand, London, W.C.2.

British Standard

Methods for the Sampling and Analysis of Fuel Gases

BS 3156:1959 is the second British Standard in a series on the sampling and analysis of gases (the first, BS 1756:1952 dealt with *flue* gases).

The well-established methods specified are, in general, applicable to most fuel gases, although the standard deals principally with those made from coal, coke, or oil, the major sources of fuel gases in the U.K.

The material in this comprehensive volume is arranged in three parts: sampling, general analysis, and special determinations. Methods are specified for obtaining snap samples, samples collected over a period under steady conditions, and samples collected over a period under fluctuating conditions. Types of apparatus for general analysis are described and illustrated and the determination of calorific value is briefly discussed (it will later form the subject of a separate British Standard).

The standard does not deal with methods of analysis based on spectroscopy, interferometry, chromatography, and similar techniques.

Copies may be obtained from the BSI, Sales Branch, 2 Park Street, London, W.1, price 25*s* (postage extra to non-subscribers).

Practical Guide to Standards Application

The British Standards Institution has published a guide to the principles and practice of applying standards in the individual firm called *The Operation of a Company Standards Department*.

It is increasingly recognized throughout industry that standards and standardization techniques properly applied at the company level are powerful aids in raising productivity and effecting savings in design, purchasing, production, and sales. Taking the first steps towards standardization in the company is far from simple, however, and it is to help firms needing such assistance that the BSI has published a guide to explain what goes on in a company standards department.

The 18-page booklet, sponsored by a joint committee of the BSI and the Institution of Production Engineers, can be obtained from the BSI, Sales Branch, 2 Park Street, London, W.1, price 3*s*. It is also available from H.M. Stationery Office.

Engineering Courses

The seventh edition of *Engineering Education in the Region*, published by the London and Home Counties Regional Advisory Council for Technological Education, should be of considerable interest to those concerned with the training of engineers or with advising school-leavers on further education courses.

The publication includes lists of degree and diploma courses, courses in direct preparation for professional examinations, HNC and ONC, etc., and for City and Guilds Certificates, etc. Price 3*s* 6*d* post free, the booklet is obtainable from the Regional Advisory Council, Tavistock House South, Tavistock Square, London, W.C.1.

"Beyond the Speed of Sound"

The new Shell film *Beyond the Speed of Sound* is the last of a series of three films in colour, entitled *High Speed Flight*, dealing with problems of aircraft behaviour below, around, and well above the speed of sound respectively. They form an extension of the earlier series *How an Aeroplane Flies*, which covered speeds very much lower than that of sound. At these lower speeds the airflow round an aircraft behaves relatively simply.

The present series explains the more complex airflow behaviour associated with flight at higher speeds, the three films giving a good basic introduction to the subject in simple terms.

The first two in the series, *Approaching the Speed of Sound* and *Transonic Flight*, have been well received in aviation circles and among those interested in science generally; they are regularly used for crew training by the airlines of many countries. *Beyond the Speed of Sound* will, it is hoped, prove equally useful to students of aeronautics and air forces generally. It should also provide useful background material for airline and airfield staffs and all air-minded people, as well as everyone interested in science and technology. With the aid of models, charts, and the animated use of various symbols, the many forces and pressures inherent in supersonic flight are lucidly explained.

The series was made with the support and help of the RAF, the USAF, several British government departments, and the aircraft industry.

Beyond the Speed of Sound was directed by Denis Segaller in Eastman Colour, has a running time of 19 minutes, and is available in 35 and 16 mm gauges.

Intelligent Agricultural Planning

Science on the farm is the theme of the first of two of the latest films produced by Shell-Mex and B.P. Ltd. *Farmers' Scrapbook: No.* 10 first shows various techniques of crop-spraying, with special emphasis on the use of the helicopter in this role for which it is particularly suited. A small Hiller helicopter is seen dealing with a swathe of 50 ft at a time. Although it carries 50 gallons of spray liquid, refilling takes little more than a minute.

The film continues by showing something of the valuable work being done at a Royal Veterinary College field station on the care and examination of animals, and of the experiments into the provision of suitable grazing for livestock over long periods at the Poultry Progeny Testing Station.

The final section of the film shows how one particular farmer used imaginative irrigation methods to deal with the problem of low summer rainfall during 1959.

The film was made for Shell-Mex and BP Ltd by Random Film Productions Ltd. It runs for 20 minutes, is in colour, and is available in 35 and 16 mm gauge.

The second film is also agricultural in character, dealing with *Land Reclamation*. It shows how, with an outlay possibly much smaller than the farmer might imagine, useless woodlands, land heavy with water, land strangled with sedge and bracken, tussocks, and rushes, can be made lush and fertile within a short time.

Each of these problems are shown one by one, and typical machinery and reclamation measures which can be used to combat them are graphically described. In addition, the different types of reclamation machinery are itemized, in relation to the varying numbers of personnel and amounts of capital available for large and small farms.

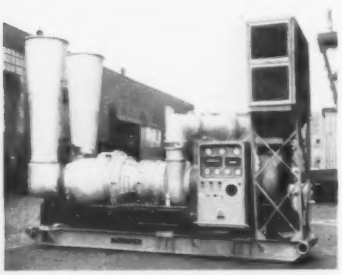
This film was also made in colour by Random Film Productions Ltd, and has a running time of 25 minutes. It is available in 35 and 16 mm guage. Copies of each of these films may be obtained on free loan from the Shell-Mex and B.P. Film Library.

Trade Literature

Skid-Mounted Gas Turbines for Crude Oil Pumping

Two Ruston and Hornsby "TA" gas turbines, mounted on skids to make them more easily transportable, will soon be pumping crude oil through an Iranian Oil Services pipeline.

They are the first "TA" turbines to be skid-mounted. The skid, which is added to the standard "TA" bed frame and gives it increased strength and rigidity, is 17 ft long and 3 ft 6 inches wide. The complete installation weighs 18,000 lb for an output of 1260 bhp.



A 3kW alternator, belt-driven from the shaft which couples the turbine to the pump, feeds a battery charger and makes the set independent of a mains electricity supply for starting. It also provides current for the local lighting of the turbine and pump.

A fan fitted to an extension of the pump shaft provides air blast cooling for the lubricating oil and eliminates the need for a motor-driven fan.

An instrument and control panel is an integral part of the turbine installation. Batteries and battery charger form a separate skid-mounted installation weighing 3500 lb, and this will be placed close to the "TA" turbine, and linked with it by cable. Similarly, the crude oil pump will form a separate skid-mounted unit. As a precaution against fire this will be housed in a separate compartment and will be driven through a dividing wall by a flexible shaft.

The skid-mounted turbines will normally run on natural gas, but should there be an interruption in the supply of natural gas they can be changed over to liquid fuel. A possible need to change from crude oil pumping to power generation can be made merely by substituting a generator or alternator for the crude oil pump—the only proviso being that the generating equipment shall carry an extension shaft for the oil cooling fan.

Electronic Associates Ltd Formed

Electronic Associates Inc. of Long Branch, New Jersey, U.S.A., manufacturers of Precision analogue computing equipment (PACE) announce the formation of Electronic Associates Ltd.

The new company is British, and has its head office and works at Victoria Road, Burgess Hill, Sussex. Manufacture is now starting of the 231–R analogue computer.

Electronic Associates Ltd is equipped to carry out studies of all types of systems, to design and construct special purpose analogue computers and simulators based on PACE modules, and to supply the fully-transistorized range of TR.10 equipment.

New Publication of S.G. Iron

The Mond Nickel Company have produced a further publication in the series dealing with the development of S.G. Iron (spheroidal graphite cast iron). The new publication, which is fully illustrated, describes its properties in detail and lists a number of important applications.

The section on properties includes tables and information on strength, toughness and ductility, elasticity, fatigue resistance, hardness, wear-resistance, thermal properties, and corrosion-resistance. Among the applications featured are examples of the use of this material in power, transport, chemical plant, and civil engineering.

The publication may be obtained free, on request from The Mond Nickel Company Ltd, Publicity Department, Thames House, Millbank, London, S.W.1.

Rocol Molysil 33 Grease

Molysil 33, the molybdenized silicone grease manufactured by Rocol Ltd, Rocol House, Swillington, nr Leeds, has received Ministry of Supply approval under the specification DTD900/4630.

Molysil 33 grease is a lubricant for precision ball bearings and actuator gear boxes and consists of molybdenum disulphide in a silico grease vehicle. It lubricates down to temperatures of −90° F, and in this capacity has proved particularly successful in the lubrication of miniature ball bearings.

Automatic Tube Expander Control Unit

Charles Wicksteed & Co. Ltd. of Kettering, has introduced a new development in tube expander equipment—the Wicksteed Mk IV electric automatic torque control unit.

A conventional electric drill type of machine is used, which automatically reverses on completion of the expansion. The equipment is supplied for either 100–120v ac or 210–240v ac 40–60 cycles. The range which can be successfully expanded with this equipment is approximately 3/8–1 inch OD tubes, but tubes closely outside this range may be accommodated, dependent on the tube material, tube wall thickness, and plate thickness.

Philippines Refinery Contract

Details have now been released of the contract secured earlier in 1959 by S. W. Farmer & Son Ltd, of Lewisham, for the fabrication of 3000 tons of structural steelwork and platework for the new refinery at Limay, Bataan, in the Philippines, for Standard-Vacuum Refining Corp (Philippines).

Secured against competition from foreign competitors, the contract is worth over £250,000, and calls for the fabrication of a Thermofor catalytic cracking unit, five heaters, 500 tons of structural steel yard pipe supports, refinery buildings, circular platforms around vessels, an air cooling unit, and off-site facilities.

Marine Fuel Oil Additive

Troublesome sludge in fuel bunkers, fuel strainers, and heat exchangers, as well as burner-fouling deposits on fuel injector tips, can be minimized, and in some cases eliminated, with a new fuel oil additive produced by Du Pont's Chemicals Division.

Known as Du Pont marine heavy fuel additive-1 (MHFA-1), the chemical breaks up sludge-forming components of fuel oils and disperses them evenly and finely through the fuel so they pass easily through burner nozzles and are consumed with the fuel.

In addition, Du Pont chemists say, the chemical will help disperse "water bottoms" and reduce burner failure due to "water slugs".

Molecular Models

Units from which molecular models, accurate with respect to stereo characteristics, can be quickly built up are produced by the Buchi Company of Switzerland, and have recently become available in the U.K. The stainless steel units consist of little rods and tubes which are soldered together at the correct angles at a point representing the atomic nucleus.

Stereomodels are assembled by introducing the rod of one unit into the tube of another and a push button type of mechanism holds the atoms at the correct internuclear distance. Only the central axes of the bonds are shown and the omission of the electron clouds gives a very clear view of the geometrical relationships and permits easy measurement of internuclear distances.

Semi-Trailer for Transporting Oilwell Pumping Units

To simplify and speed up the movement of pumping units to and from well sites, a special semi-trailer was shipped recently to Compania Shell de Venezuela Ltd, Maracaibo.

Produced by R. A. Dyson & Co. Ltd, of Liverpool, to the requirements of Shell engineers, the semi-trailer will transport completely-assembled pumping units weighing up to 25 tons for erecting and servicing. Its overall length is 36 ft 7½ inches, with a width of 11 ft 6 inches.

The equipment incorporates a tilting bed, actuated by hydraulic rams powered by a self-contained Petters AVA.2 two-cylinder air-cooled diesel engine.

To load the trailer, it is positioned close to the pumping unit with the tilt bed forming an inclined plane. The tractor to which the trailer is coupled has a power-driven winch. The pumping unit is drawn by the winch cable on to the tilt bed where it is secured and the tilt bed returned to the horizontal. To unload, the operation is reversed. The tilt bed is provided with adjustable guide rails for sideways location of the pumping unit. Extensible legs for supporting the trailer when uncoupled from its tractor are hydraulically operated. Screw-operated legs support the rear of the tilt bed when it is required to load from a platform.

Electronic Control in the Petrochemical Industry

The first application in the world of electronic process control equipment to an oil refinery, was the SO_2 extraction plant at Llandarcy in 1951. Subsequent years have seen so many further applications for electronic control in the petrochemical industry that the technique has now become an accepted and essential feature of modern process engineering.

Recently a large control panel and desk was inspected at the Chiswick works of Evershed and Vignoles Ltd, prior to its installation at the Dinslaken oil refinery, of the BP Benzin und Petroleum Aktiengesellschaft, which is being constructed by Kellogg International Corp.

It is remarkable that certain features of the original Evershed equipment at Llandarcy have been retained in this advanced new installation, as they still represent the most up-to-date practice. For example, the instruments operating on the Evershed electronic repeater principle for the distant transmission of plant variables are not basically different from those originally employed at Llandarcy. The original process controller, Mark I, on the other hand, has passed through a number of stages in its evolution from the electro-mechanical to the electronic static mode of operation.

The control desk for Dinslaken contains the process controllers, indicating and recording facilities, supervisory instruments, and manual control provisions for two crude distillation plants, a hydrofiner, a catalytic reformer, and a re-distillation unit. Thus it accommodates within a remarkably small space every one of the 120 separate control loops which are required for the operation of the refinery.

Particular care has been taken to reduce the number of supervisory personnel required for the day-to-day operation of the plant. The extensive use of "in-line scanners" greatly facilitates this. During satisfactory operation of the refinery, an unbroken shadow line is presented to the operator, and any break in this line immediately pinpoints the part of the refinery where a deviation from desired conditions has occurred; it also gives an indication of the magnitude and direction of this deviation.

An unusual feature of the control panel is the provision of only two recorders for each panel (apart from the recorders employed for standard temperature measurements), each permitting the recording of plant parameters from sixteen different points distributed widely throughout the refinery through a simple plug-in selection system.

The plug-in recording facilities have been made possible by one of the inherent features of the Evershed electronic repeater measurement system which automatically compensates for any additional display or recording instrument which may be temporarily inserted into the measurement circuit, without effect on the accuracy of the system as such.

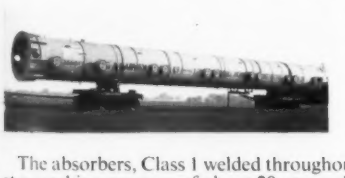
Gas-Liquid Chromatographic Detector

H. Tinsley & Co. Ltd, of Werndee Hall, London, S.E.25, has added a new chromatographic detector to its range of scientific instruments. Originally designed by Dr D. W. Turner of Imperial College, the detector depends for its action upon changes in dielectric constant of the emergent stream: this may be either gas or liquid. Changes in the electrical capacitance of a suitably-designed cell are converted into corresponding voltage fluctuations by means of an adjoining unit.

This method of detection is absolutely independent of the rate of the gas flow, and is particularly suitable for preparative scale chromatography.

Oil Gasification Equipment for Isle of Grain

G. A. Harvey & Co. (London) Ltd, Woolwich Road, London, S.E.7, have recently delivered the first of two 120 ft absorber columns to the South Eastern Gas Board's Isle of Grain works. They are part of the high-pressure oil gasification installation now being built by Woodhall-Duckham Company Ltd.



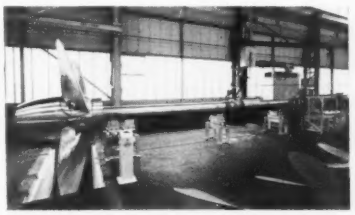
The absorbers, Class 1 welded throughout, designed for operation at a working pressure of about 20 atmospheres (300 psi) are for the high pressure CO_2 removal plant. They weigh approximately 100 tons each and are 9 ft 4 inches overall diameter.

The illustration shows the absorber en route to the Isle of Grain from Harvey's Greenwich works.

Controllable Pitch Propeller for Free Piston Gas Turbine

Britain's largest controllable pitch marine propeller was recently on show at the works of its manufacturer, Stone Marine Engineering Co. Ltd, at Charlton.

Manufacture of this type of Stone-KaMeWa propellor was begun in 1945, and since then over 75 installations have been supplied to total of 100,000 hp. This propeller had been wholly manufactured by Stone and its U.K. sub-contractors under exclusive licence from Aktiebolaget Karlstads Mekaniska Werkstad, the Swedish Kaplan water turbine and controllable pitch propeller designers and manufacturers.



The 4-bladed propellor inspected was being built to the order of Smith's Dock Company Ltd for a free piston gas turbine-powered cargo ship for the Bolton Steam Shipping Co. Ltd. Blades and hub are in bronze, the hollow bored shafting in steel, and the main control and oil distribution box in cast iron.

The length of the propeller is 460 ft; breadth 63 ft; draft 27 ft 6 inches; and of 4000 shp at 110 rev/min.

Pitch-changing is controlled hydraulically by a piston within the propeller hub which is mechanically linked to the blades. Movement of the piston is controlled by a regulating valve in the hub servomotor actuated by a tube through the hollow tailshaft. The tube also feeds the oil to the regulating valve, and oil displaced during pitch changing is returned between the tube and the bore of the tailshaft. Movement of the tube is controlled by a servo-operated fork mechanism actuating a sliding collar on the shaft, keyed to the end of the control tube through a slot in the shaft.

High-Pressure Pipe Connexion

Among the exhibits at the Engineering Materials and Design Exhibition, to be held at Earl's Court in February 1960, will be the Ruston-Grayloc high-pressure pipe connexions on show on Ruston and Hornsby Ltd's stand.

These connexions, employing sealing principles entirely different from those of any other seal, are lighter and smaller than conventional bolted flanged connexions for a given duty, and can be made and broken rapidly and repeatedly, using the same seal member.

The Ruston-Grayloc connexion is made under licence from the Gray Tool Company, of Houston, Texas.

Multi-Wash System

A brochure describing the Holmes-Schneible multi-wash system for the collection and cleaning of dust-laden gases and fumes, is obtainable from W. C. Holmes & Co. Ltd, P.O. Box No. B.7, Turnbridge, Huddersfield.

An efficiency for the system for all particles above three to four microns is guaranteed. Laboratory facilities exist for the examination of dust and fumes by the Company and, where necessary, arrangements can be made for pilot plants to be installed for trial purposes.

Honeywell Control Millivoltmeters

Basic details of the line of millivoltmeters produced by Honeywell Controls Ltd, Ruislip Road East, Greenford, Middlesex, are given in a new pamphlet covering their indicators and controllers.

Heating Equipment for Chromatograph

The design and construction of heating equipment for the heating column of the Pye Argon chromatograph unit for W. G. Pye & Co. Ltd, of Cambridge, was recently achieved by Isopad Ltd, Boreham Wood, Herts, by the use of an *Isojacket*.

The exacting requirements were provision for any selected temperature up to 250 C, with 0·5 accuracy, even distribution of temperature over the whole length, and a temperature rise at the rate of 10 C per minute.

Powell Duffryn Engineering Acquisition

Powell Duffryn Ltd announces that it has acquired the whole of the share capital of Pipeweld Ltd, Paston Road, Wythenshawe, Manchester, 22.

Pipeweld Ltd has for many years undertaken all forms of pipework, including installations at oil refineries and at oil, chemical, and gas plants, and pipelines.

Slow-Speed Hydraulic Motor

Chamberlain Industries Ltd, of Staffa Works, Argall Avenue, London, E.10, reports an addition to their range of slow-speed hydraulic motors. The *Staffa Mark V* has seven cylinders, each having a bore diameter of 4 inches and a stroke of 3 inches.

Whilst the general design is similar to the five-cylinder type, the crankcase and cylinders of the Mark V form a monobloc casting, with the seven cylinders arranged radially and each fitted with a detachable head. At the normal working pressure of 2000 psi the manufacturers state that the maximum output torque is 6650 lb ft, with an overall efficiency rating of 94·2 per cent.

Procon Forms New Australian Company

Procon Inc has announced formation of a new company, Procon Pty Ltd, in Sydney, Australia.

The new firm has been formed to increase services to Procon's growing number of Australian customers. Procon has already completed five refining installations in Australia and has several more projects under contract there. Marshall F. Lindberg, who has been in charge of Procon's construction forces in Australia for several years, has been appointed general manager of the new company.

In addition to the new Australian organization, Procon has affiliated companies in Great Britain, Canada, and Latin America.

More Reagents for Research

L. Light & Co. Ltd, of Colnbrook, Bucks, have just issued their 1960 catalogue of over 5000 substances which embrace organic chemicals for syntheses, biochemicals, enzymes, and analytical reagents. Particular emphasis has been placed on the manufacture of chromatographically-pure laevo-amino acids and peptides.

A specialized laboratory is now being equipped to produce crystalline enzymes on a pilot scale, and multi-purpose, all-glass 100 litre pilot plant has been erected to cope with the demand for custom syntheses.

To satisfy requirements for semi-conductor materials, L. Light & Co. Ltd, now offer a wide range of ultra-pure elements such as gallium, antimony, arsenic, and phosphorus.

Engines for Agricultural and Marine Use

A new agricultural engine designed for larger types of self-propelled combine harvesters, medium or heavy wheeled, and crawler tractors is announced by Perkins Engines Ltd, Peterborough.

The engine will be known as the Six 288(TA)—following the current Perkins practice of naming engines from the number of cylinders and cubic inch capacity—and is a six-cylinder, vertical in-line power unit developing 76 bhp at 2000 rev/min. Maximum torque is 207 lb ft at 1400 rev/min.

Perkins Engines Ltd also announce a new five-litre marine diesel engine—the Six 305(M). It has a six-cylinder, vertical, in-line, power unit developing 84 shp at 2400 rev/min for intermittent running. The continuous rating is 68 shp at 2000 rev/min. It is particularly suitable for various types of pleasure craft and is available with direct sea cooling, fresh water keel cooling, or fresh water heat exchanger cooling.

New Heat Transfer Medium

Thermex heat transfer medium has been added to the range of phenol derivatives made by the Heavy Organic Chemicals Division of ICI. It is a eutectic mixture of diphenyl oxide and diphenyl in the respective proportions by weight of 73·5 per cent and 26·5 per cent, and is the first heat transfer medium of this type to be manufactured commercially in Britain.

A highly-desirable combination of physical properties makes *Thermex* particularly suitable for liquid-phase and vapour-phase heating and cooling in a variety of industrial processes. It has a high boiling point (225 C) and low freezing point (12 C), and excellent thermal stability over long periods at temperatures up to 400 C. It has high heat transfer coefficients, particularly in the vapour phase, and is non-corrosive and presents a negligible fire risk.

Birlec Change of Name

It is announced by Birlec Ltd that, with effect from 1 January 1960, the Company name is A.E.I.-Birlec Ltd.

The change coincides with the final reorganization of the structure of the parent company, Associated Electrical Industries Ltd, into several product divisions. The internal organization of Birlec Ltd will not be affected.

The name of its associate company, Birlec-Efco (Melting) Ltd, will not be changed.

Forthcoming Meetings

THE INSTITUTE

Annual Dinner (*Grosvenor House*) **17 February**

(*At 61 New Cavendish Street, London, W.1, 5.30 p.m.—tea 5 p.m.*)

Corrosion Problems in the Lacq Field. M. Estavoyer (SNPA) **2 March**

IP ESSEX BRANCH

(*At Railway Hotel, Pitsea, 7.30 p.m.*)

Low Temperature Engineering. E. H. Adams, A.M.I.Mech.E., A.M.I.Chem.E. **17 February**

IP FAWLEY BRANCH

(*At Esso (Fawley) Recreation Club, Holbury, 7.30 p.m.*)

Modern Car Developments **10 February**

IP LONDON BRANCH

(*At 61 New Cavendish Street, London, W.1, 6 p.m.—tea 5.30 p.m.*)

Atomic Power for Marine Applications. G. Fawn, B.A., A.F.R.Ae.S. **25 February**

IP SCOTTISH BRANCH

(*At N.B. Hotel, Edinburgh, 7.30 p.m.*)

Visit by the President of the Institute, C. M. Vignoles, C.B.E. **23 February**

IP SOUTH-EASTERN BRANCH

(*At King's Head Hotel, Rochester, 7.45 p.m.*)

Joint Meeting with R.I.C. Medway College of Technology **3 March**

IP SOUTH WALES BRANCH

(*At the Training Centre, BP Refinery (Llandarcy) Ltd, 5.30 p.m.*)

Annual General Meeting. Film Show **11 February**

IP STANLOW BRANCH

(*At Chester Public Library, St. John Street, Chester, 7.30 p.m.*)

Problems With the Use of High Sulphur Content Fuel Oils at Marchwood Power Station and Experience With Chemical Additives. T. J. Wilkinson, B.Sc.(Eng.), A.M.I.Mech.E., M.I.E.E., and D. Clarke, A.M.I.E.E., A.M.I.Mech.E. **18 February**

Agricultural Chemicals. J. L. Hunt, Dip. Hort.(Wye). (Joint Meeting with R.I.C.) **3 March**

IP YORKSHIRE BRANCH

(*At the Hotel Metropole, Leeds, 7 p.m.*)

Petroleum and the Law. V. Biske, B.Sc., LL.M., F.R.I.C. **10 February**

IP ECONOMICS AND OPERATIONS GROUP

(*At 61 New Cavendish Street, London, W.1, 5.30 p.m.—tea 5 p.m.*)

Saharan Oil and Gas. Speaker from Direction des Carburants **11 February**

THE SOCIETY OF INSTRUMENT TECHNOLOGY

(*At the Manchester Room, Central Library, St. Peter's Square, Manchester 1, 6.45 p.m.*)

Some Instrument Developments in the Oil Industry. G. C. Eltenton, B.A., F.Inst.P. **8 March**

* * *

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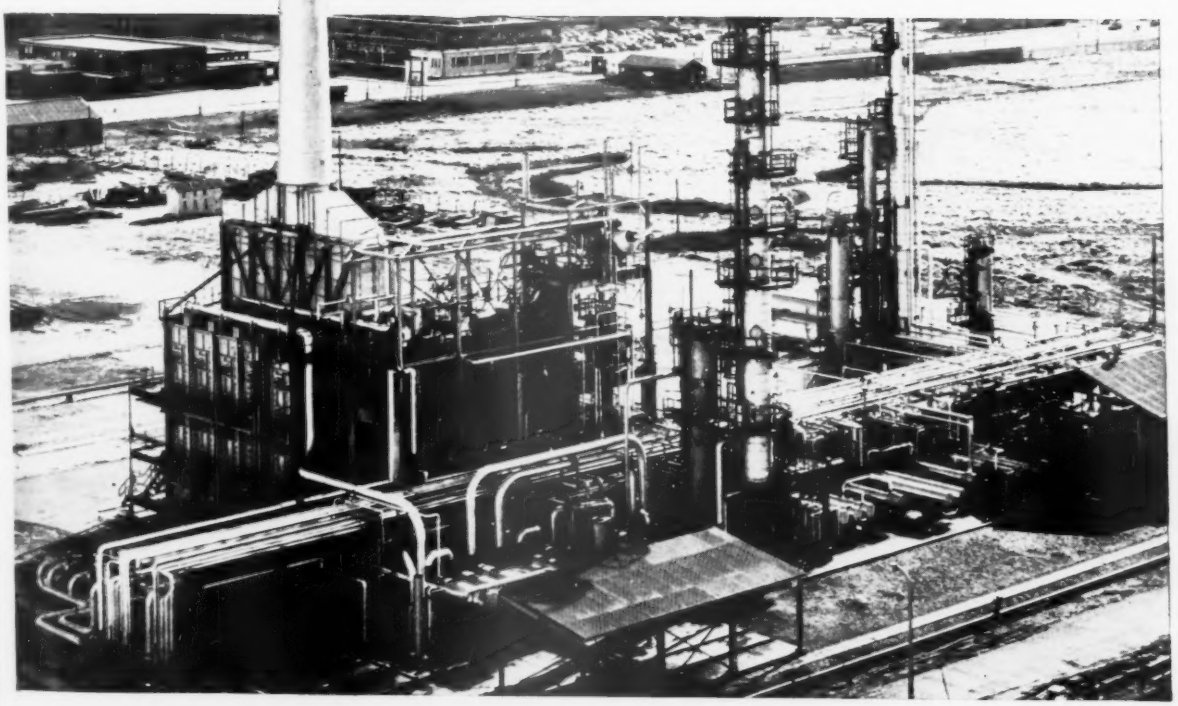
Spence COMOX catalyst is used for desulphurisation in oil refineries throughout the world. COMOX is noted for its long life, high activity, selectivity and robustness under the most severe operating conditions. Spence Product Development Department will gladly provide further information on COMOX and other catalysts which are available in commercial and development quantities.



Mobil Refinery, Coryton. Photograph by courtesy of Mobil Oil Co. Ltd.

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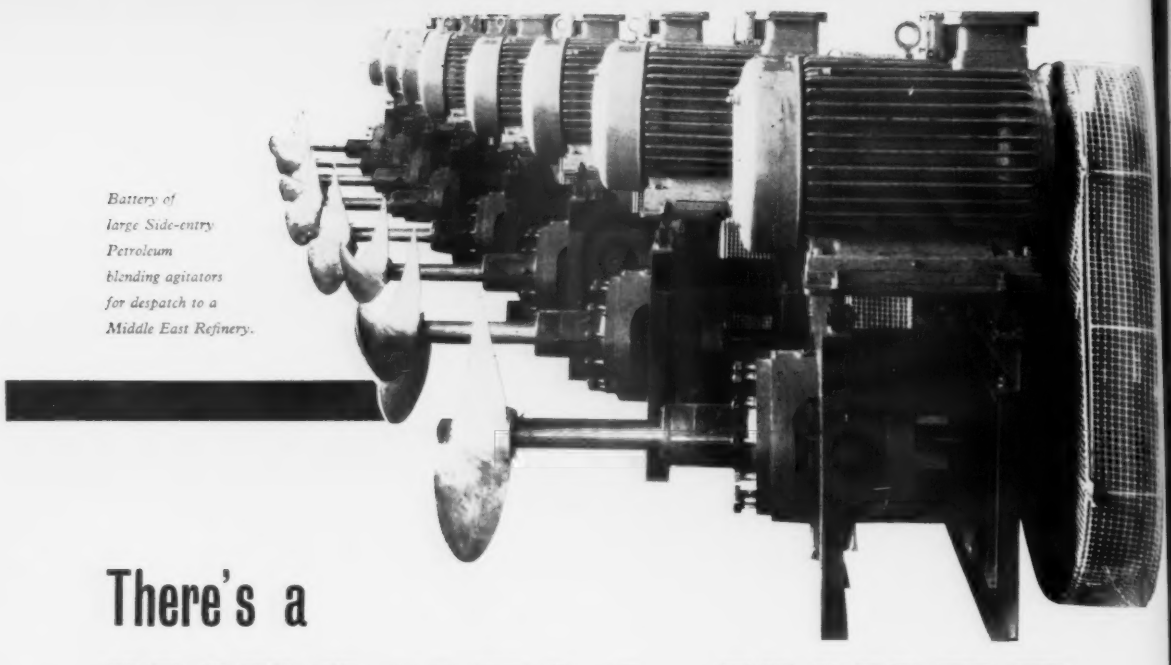

Battery of large Side-entry Petroleum blending agitators for despatch to a Middle East Refinery.

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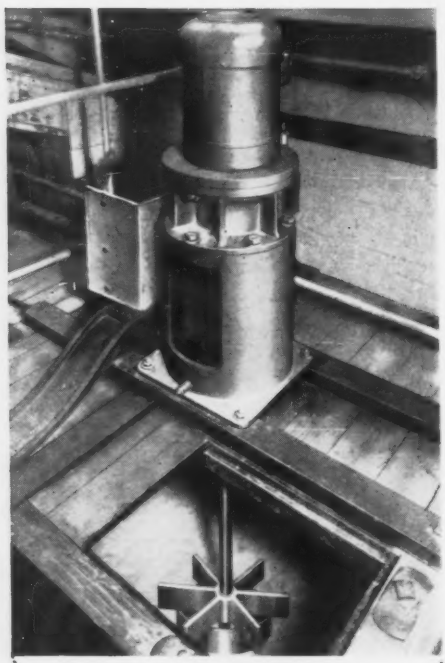
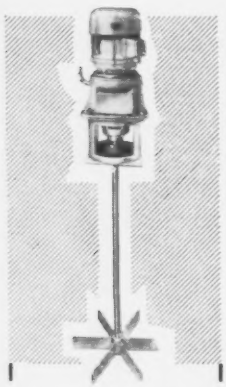
for every industrial need

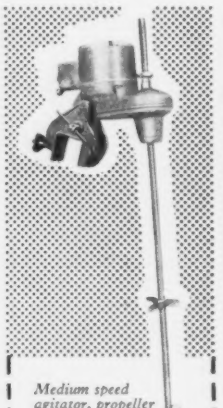
Whether your problem is oil blending, addition of additives, incorporation of the fats and greases, grease mixing or chemical mixing in reaction vessels on batch or continuous basis it will pay you to consult



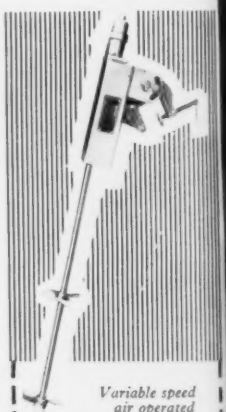
GVD type medium speed fluid mixer fitted with open type turbine impeller and stabiliser ring for oil and grease blending and for the inclusion of additives into lubricating oils.



Heavy duty 460 r.p.m. permanently mounted fluid mixer with turbine impeller.



Medium speed agitator, propeller type for oils and grease blending.



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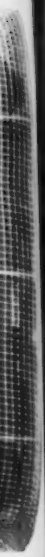

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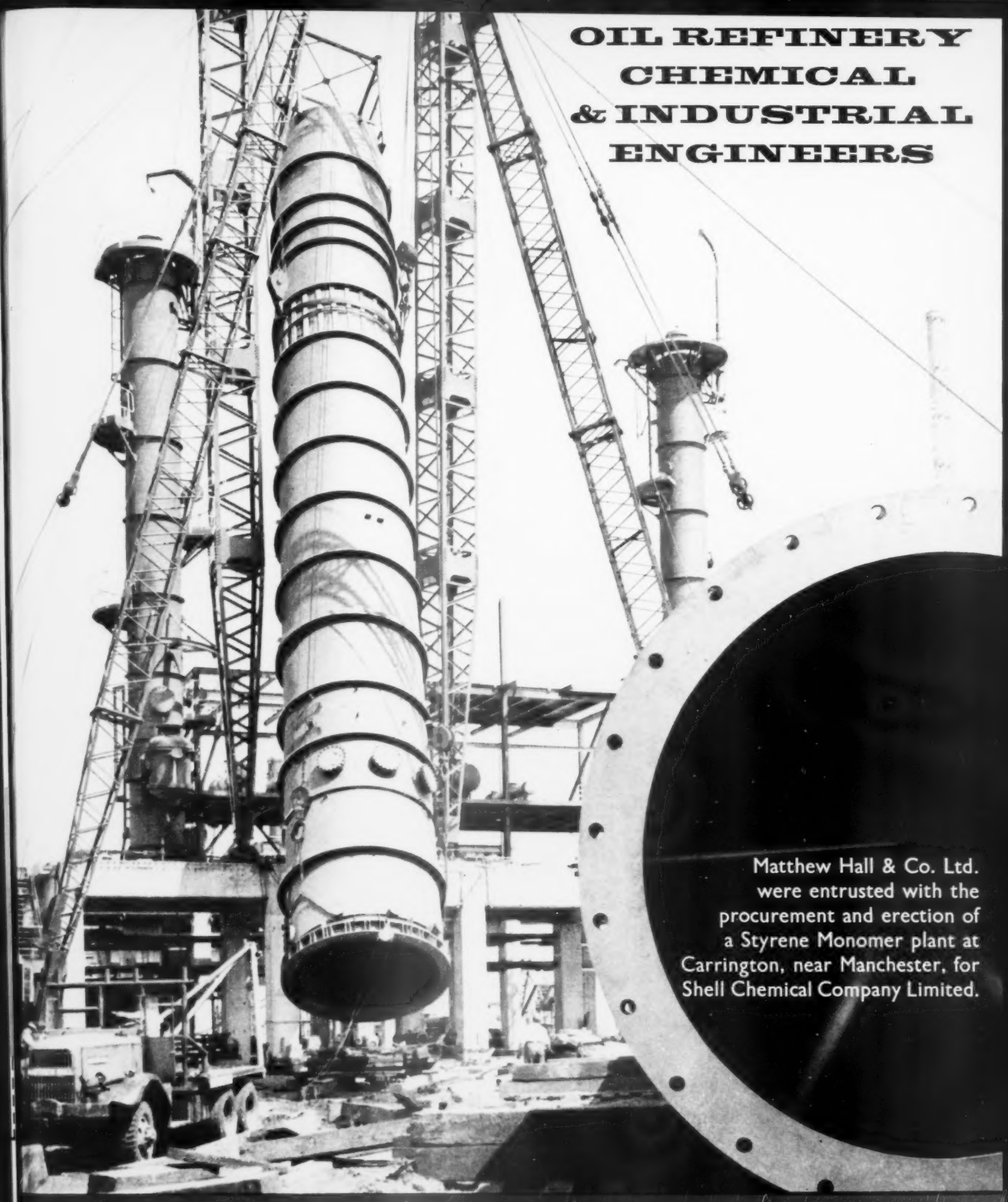

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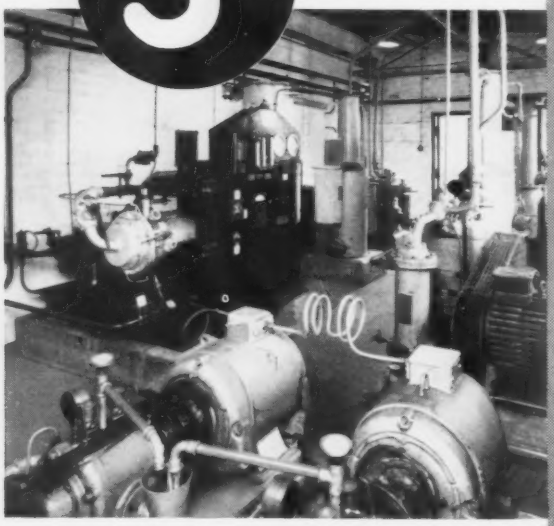

Two Holmes-Kemp Inert Gas Generators installed at the Speke Works, Liverpool, of Messrs. Beck Koller & Co. (England) Ltd. Each of these machines is capable of producing 3,000 cubic feet of gas per hour.

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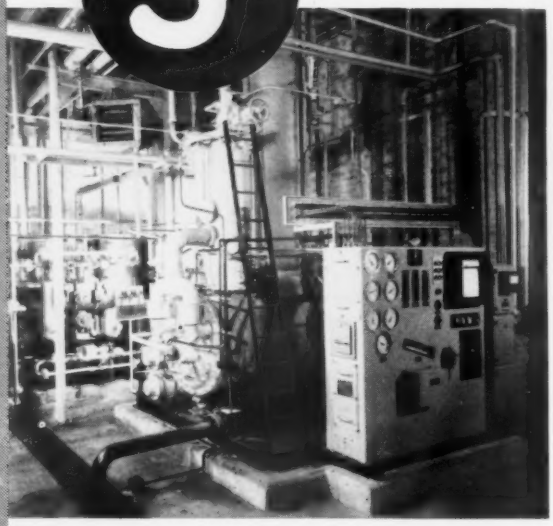

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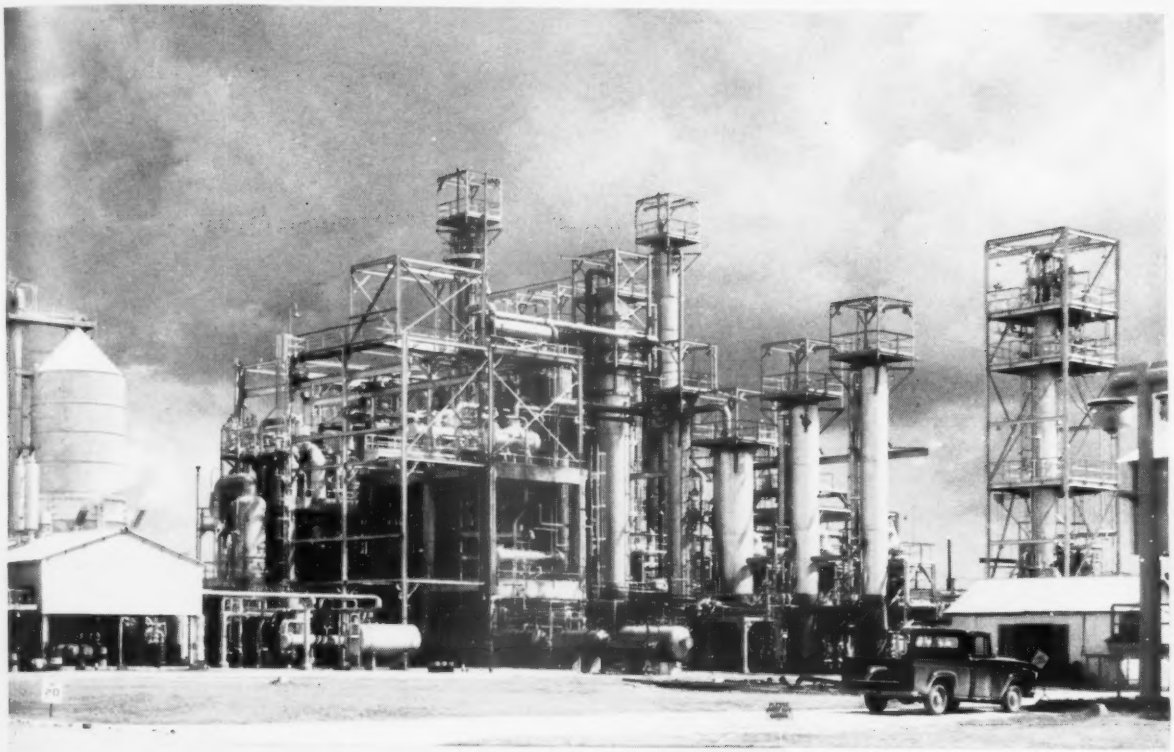

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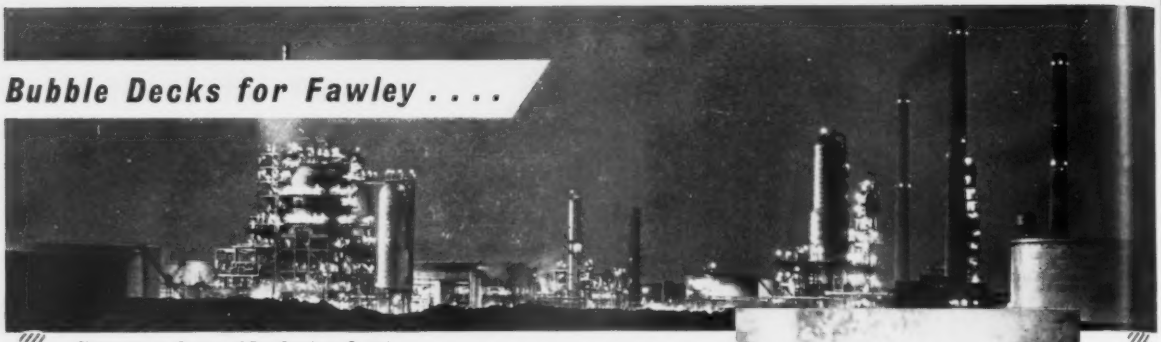

Photographs by Courtesy of Esso Petroleum Co. Ltd.

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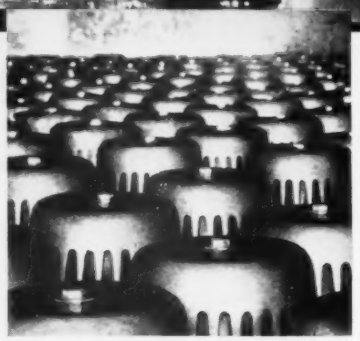

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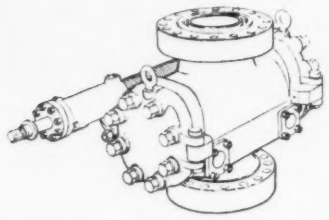

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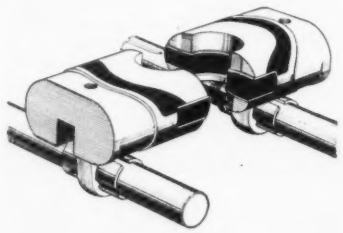
When you are drilling, you're looking for pressure—and higher pressure means higher profit.



Ram actuator shafts rotate—are sealed at both ends to produce pressure balance for extra-easy operation.

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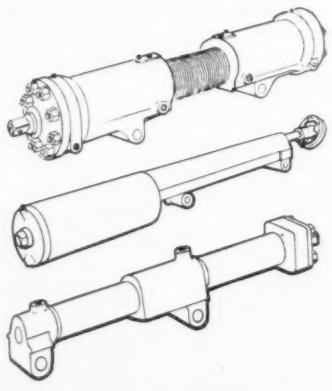
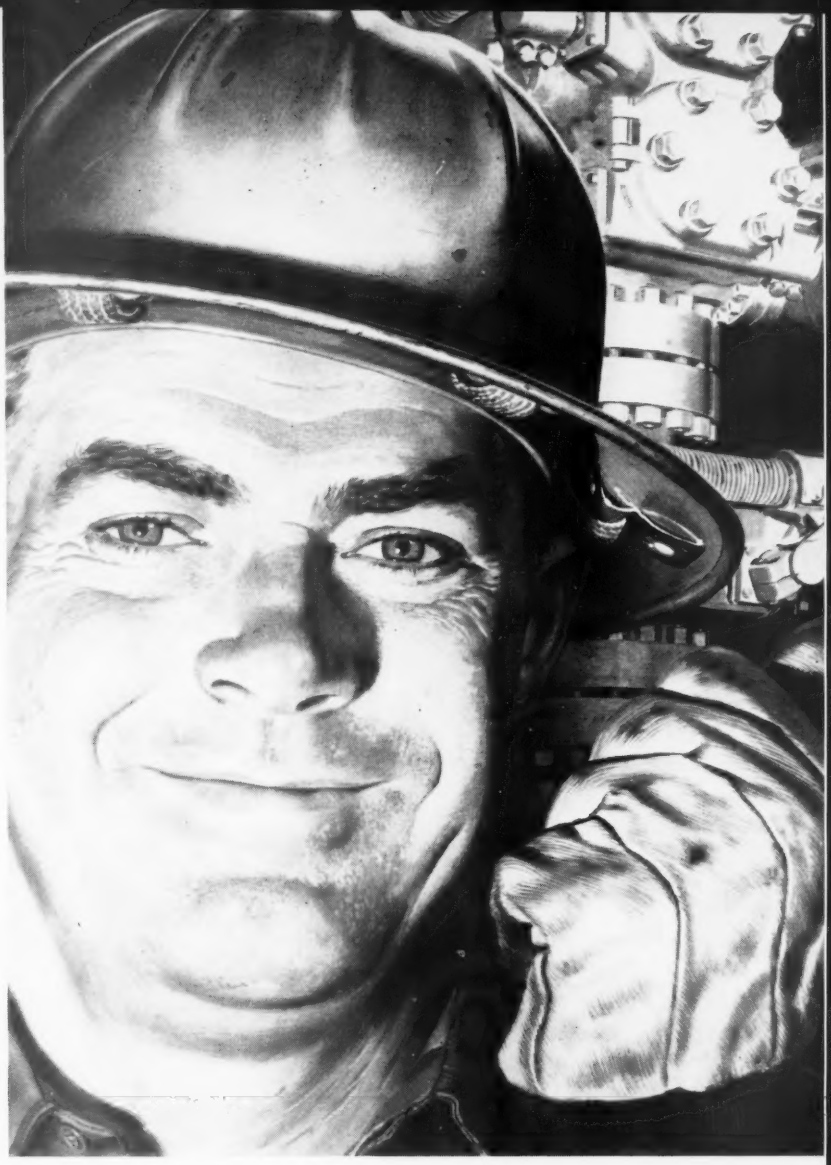


Type "F" Preventers are available with interchangeable operators for hydraulic, air or manual service.



Since we developed the first successful preventer, almost 40 years ago, a majority of successful operators all over the world have relied on the safety, service and economy of our efficient units.

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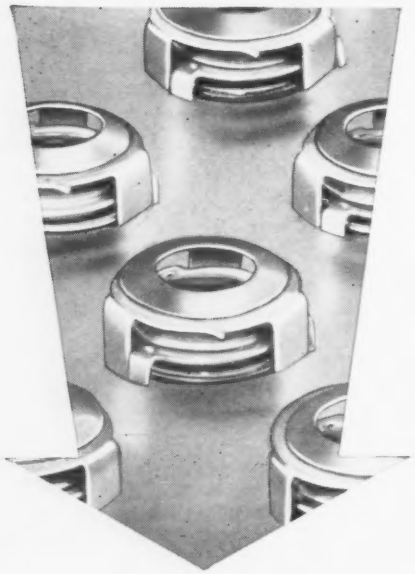

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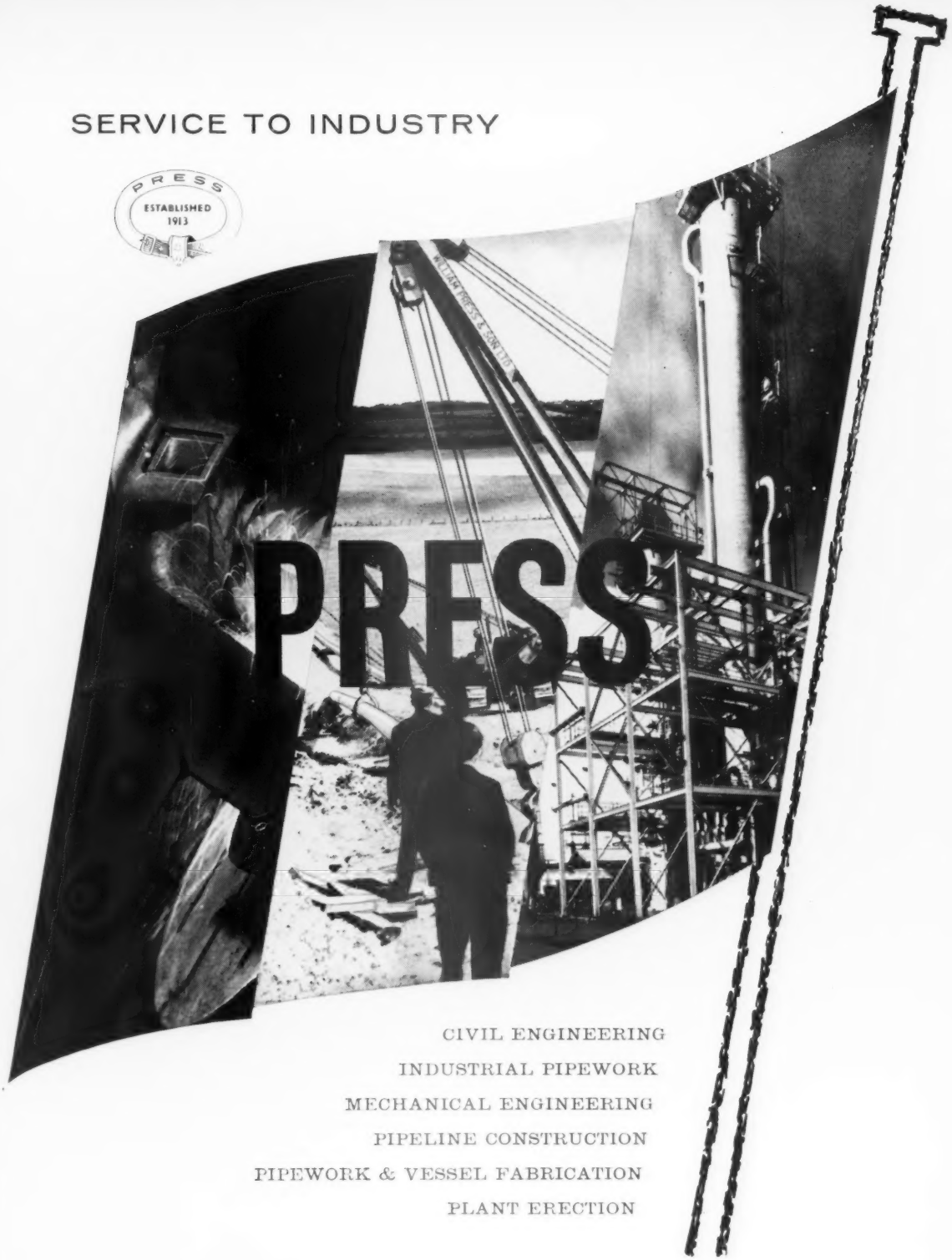

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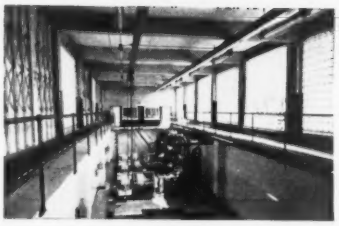
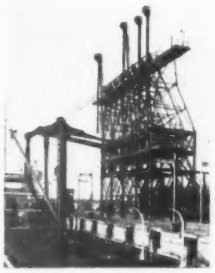


Interior of new electric pump house. Pumps ensure rapid delivery of the heaviest fuel oils.



Manifold pits housing pipe line headers and control valves. (*Above*)

Electrically operated high capacity hose handling equipment discharges up to 3,000 tons an hour. (*Left*)

One of the two new jetties built specially to accommodate tankers up to 65,000 tons.

To handle the ever-increasing tonnage of oil and oil products at the Thames Haven installation a steady progression of modernisation and extension has been in operation for the last ten years.
Storage accommodation has been doubled to nearly 300 main tanks holding up to 17,000 tons each, providing a total tankage capacity of 1,750,000 tons.

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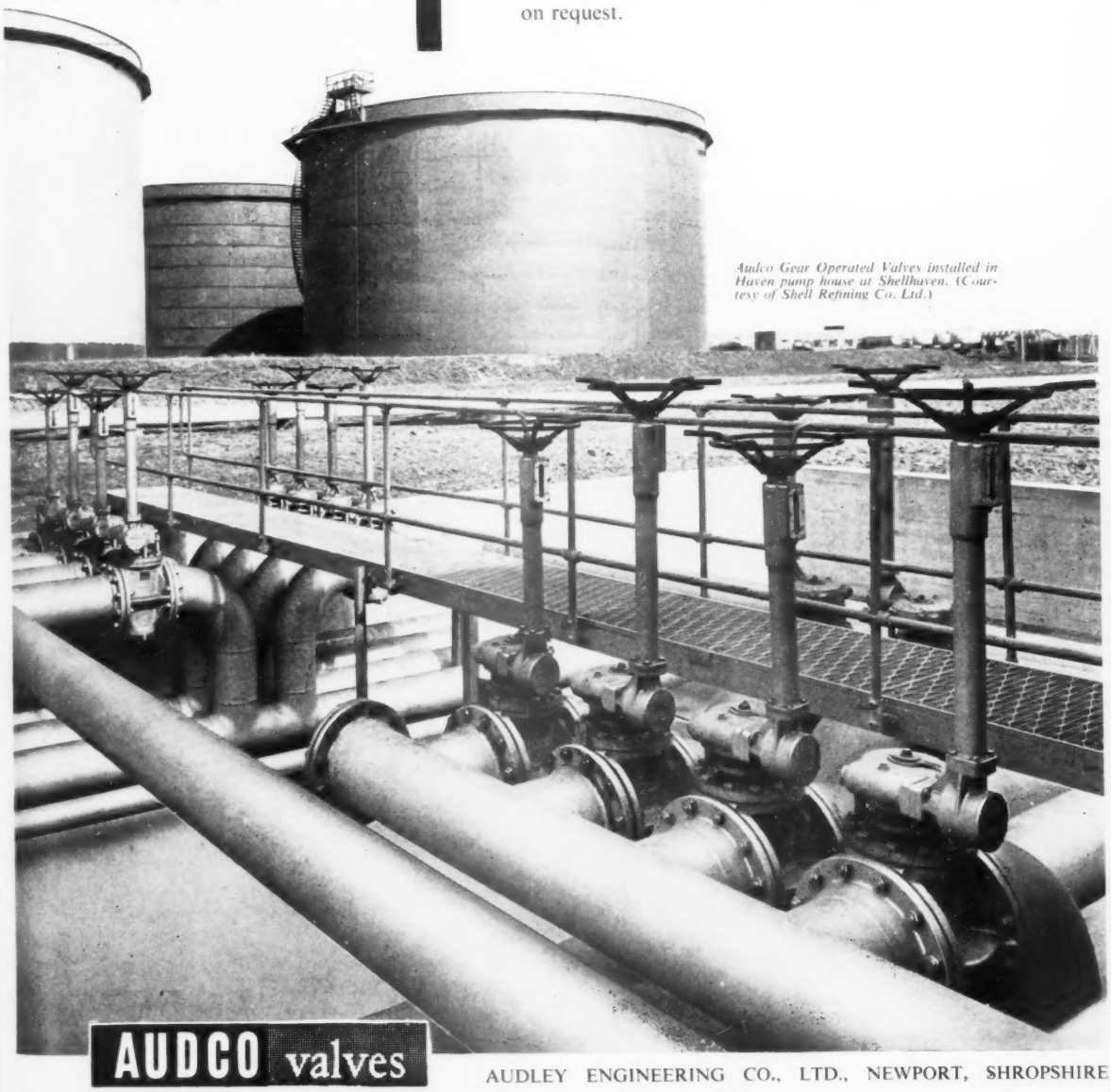

Audco Gear Operated Valves installed in Haven pump house at Shellhaven. (Courtesy of Shell Refining Co. Ltd.)

AUDCO valves

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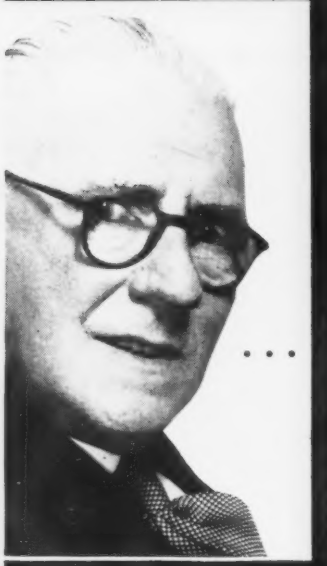

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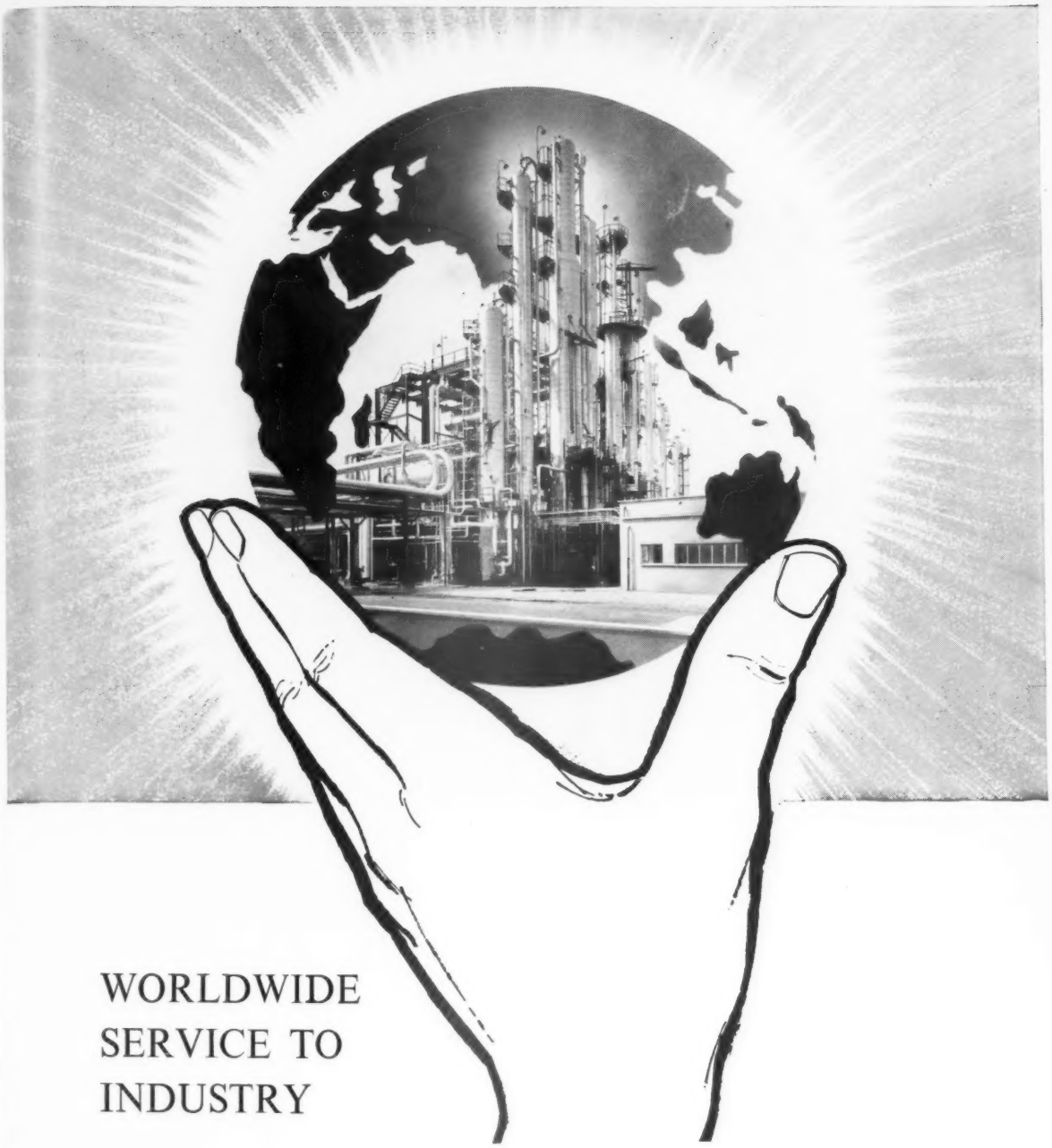
(Advertising Agencies in italics)

	Page
Anchor Chemical Co. Ltd ... ... *(Mayfair Advertising Ltd)*	xxii
Audley Engineering Co. Ltd ... ... *(Edward Hilton Advertising Ltd)*	xxvii
Beldam Asbestos Co. Ltd ... ... *(G. J. Lashbrook Advertising)*	Jan.
Victor Blagden & Co. Ltd ... ... *(Press & General Publicity Service Ltd)*	Dec.
Blaw Knox Chemical Engineering Co. Ltd ... *(Auld & Tilbury Ltd)*	Jan.
BP Trading Ltd ... ... *(Bomas Ltd)*	iv
Cameron Iron Works Inc ... ... *(Boone and Cummings)*	xxi
Causeway Reinforcement Ltd ... ... *(Max Arnold Ltd)*	Jan.
Clark Bros. Co. (One of the Dresser Industries) *(Persons Advertising Inc)*	Jan.
A. F. Craig & Co. Ltd	vi
Crosby Valve & Engineering Co. Ltd	Dec.
Dorr-Oliver Co. Ltd	Jan.
Drayton Regulator & Instrument Co. Ltd ... *(Fordham Sadler Advertising Ltd)*	Nov.
Drums Ltd ... ... *(Mayfair Advertising Ltd)*	xiv
Esso Petroleum Co. Ltd ... ... *(McCann-Erickson Advertising Ltd)*	xiii
Falk Stadelmann & Co. Ltd ... ... *(Allardyce Palmer Ltd)*	xi
Fodens Ltd ... ... *(Herbert Greaves Ltd)*	Jan.
A. Gallenkamp & Co. Ltd ... ... *(D. J. Mackridge & Partners Ltd)*	Jan.
G. S. Hall Ltd ... ... *(Industrial Publicity Service Ltd)*	xxviii
Matthew Hall & Co. Ltd	xvii
John Harper & Co. Ltd ... ... *(Rowlinson-Broughton)*	Nov.
W. C. Holmes & Co. Ltd ... ... *(Cross-Courtney Ltd)*	xviii
Honeywell Controls Ltd ... ... *(T. G. Scott & Son Ltd)*	Jan.
International Paints Ltd ... ... *(Mayfair Advertising Ltd)*	Jan.
Island View Storage (Pty) Ltd ... ... *(Richard F. Robinow)*	Dec.
A. Johnson & Co. (London) Ltd... ... ... *(A. T. A. Advertising Ltd)*	xx
S. H. Johnson & Co. Ltd ... ... *(Mayfair Advertising Ltd)*	Jan.
Kellogg International Corporation ... ... *(Reynell & Son Ltd)*	v
Lake & Elliot Ltd ... ... *(Ripley, Preston & Ltd)*	Jan.
J. & T. Lawrie Ltd ... ... *(Doig Advertising Ltd)*	Jan.
London & Thames Haven Oil Wharves Ltd ...	xxv
M. & C. Switchgear Ltd ... ... *(Rex Publicity Ltd)*	Jan.
A. & J. Main & Co. Ltd ... ... *(Hannaford & Goodman Ltd)*	Dec.
Metal Containers Ltd ... ... *(General Advertising Co. of London)*	Back Cover
Metal Propellers Ltd ... ... *(Hall Publicity Ltd)*	xxii
Mission Manufacturing Co. Ltd ... ... *(Walter Skinner Ltd)*	ii
L. A. Mitchell Ltd ... ... *(Wilson Advertising Ltd)*	xvi
Mobil Oil Co. Ltd ... ... *(Masius & Ferguson Ltd)*	xxiv
Motherwell Bridge Contracting & Trading Co. Ltd ... ... *(Chapmans Advertising Ltd)*	Dec.
Nu-Swift Ltd ... ... *(Chapmans Advertising Ltd)*	x
F. Perkins Ltd ... ... *(Crane Publicity Ltd)*	Jan.
P. G. Engineering Ltd	iii
Premaberg (Great Britain) Ltd	i
W. Press & Sons Ltd ... ... *(Kingham Advertising Agency)*	xxiii
John Rabone & Sons Ltd	Jan.
Richardsons, Westgarth & Co Ltd ... ... *(Notley Advertising Ltd)*	vii
Rotork Engineering Co. Ltd ... ... *(Trowbridge Pritchard & Co. Ltd)*	xx
Serck Radiators Ltd ... ... *(Longleys & Hoffmann Ltd)*	Inside Front Cover
Shell International Petroleum Co. Ltd ... ... *(Graham & Gillies Ltd)*	Jan.
Shell-Mex & B.P. Ltd ... ... *(Colmans, Prentis & Varley Ltd)*	xxvi
SIE Division of Dresser AG ... ... *(J. Wild Recklameberator BSR)*	Oct.
Peter Spence & Sons Ltd ... ... *(Holmwood Advertising Ltd)*	xv
Stewarts and Lloyds Ltd ... ... *(H. Raymond Morgan)*	ix
Stone & Webster Engineering Ltd *(Thames Advertising Services Ltd)*	Inside Back Cover
Stothert & Pitt Ltd ... ... *(Trowbridge, Pritchard & Co. Ltd)*	Jan.
Surface Protection Ltd ... ... *(Nigel Rainbow & Partners Ltd)*	xix
H. Tinsley & Co. Ltd ... ... *(James Sutherland Publicity Ltd)*	viii
Vokes Ltd ... ... *(Trowbridge Pritchard & Co. Ltd)*	xii
West's Piling & Construction Co. Ltd ...	Jan.
Whessoe Ltd	Jan.



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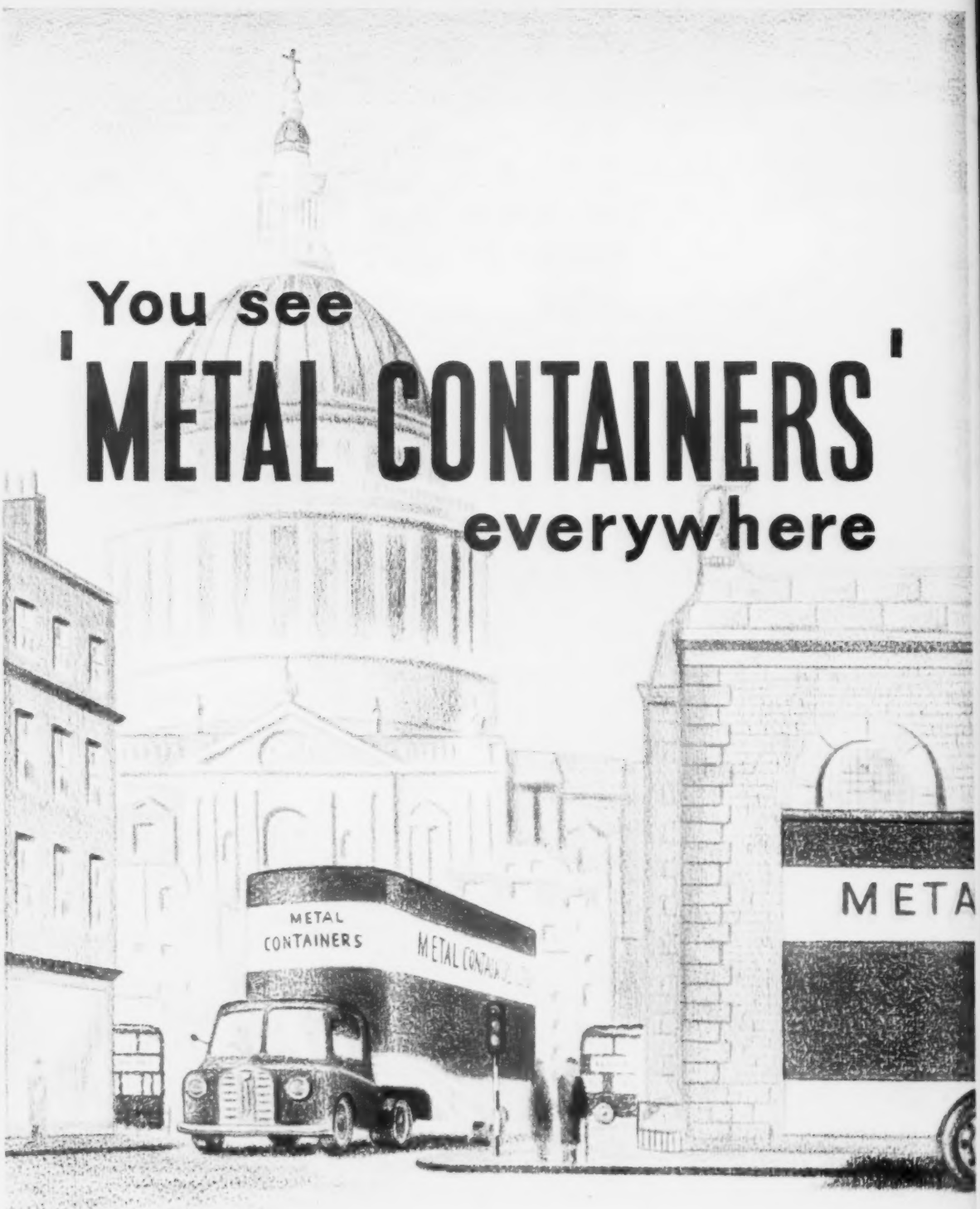

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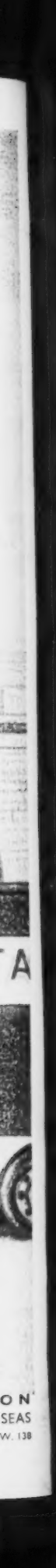
M-W. 138